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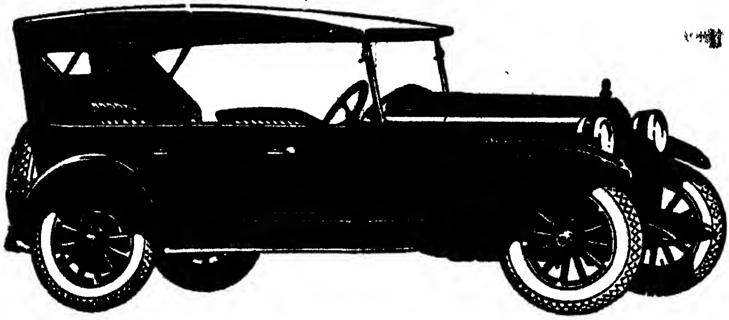

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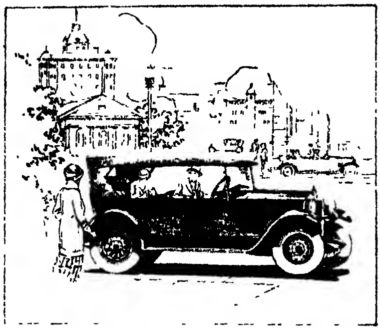

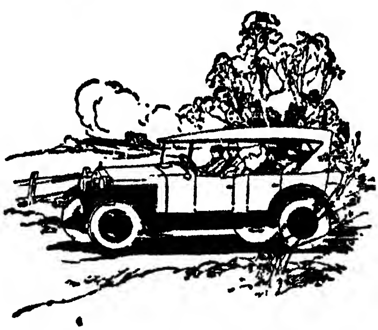

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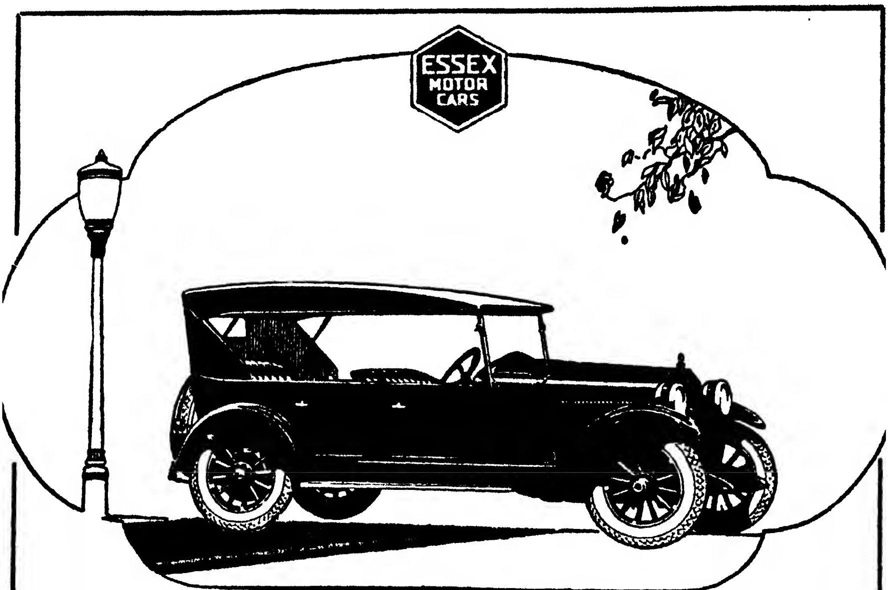
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Agricultural Gazette of New South Wales.

Crop-growing Competitions, 1924.

INTRODUCTORY NOTE.

A. H. E. McDONALD, H.D.A., Chief Inspector of Agriculture.

THOSE engaged in the promotion and carrying out of crop competitions have in view as a very definite object the general improvement of farm methods. In every district there is room for improvement, and in every district there are some farmers who, by their methods, consistently obtain better results than most of their neighbours.

There has latterly been a more general recognition of the fact that the prosperity of all the people depends upon the farmer being prosperous. It has taken some of the very hard lessons of widespread droughts to teach this, but it is a very valuable lesson for all to have learnt, because disregard and indifference to the farmer's interest is harmful to him and to the community.

It is this interest in the farmer which has encouraged the local agricultural societies so energetically and enthusiastically to take up crop competitions.

Very useful and valuable work is being quietly done by the Agricultural Instructors of the Department in stimulating interest in these competitions, and in assisting in the organising work, as well as actually judging the crops.

The growth of the crop competition movement in recent years has been remarkable. The Murrumbidgee Pastoral and Agricultural Association was the pioneer of the movement, conducting competitions nearly twenty years back. It was towards the end of the war that the feature began to attract general interest, and by 1917 several competitions were annually in progress. In that year the Royal Agricultural Society took a practical interest in the matter by promoting a championship competition, and from that time the competitions have rapidly developed into the present important programme, which provides for competitions being held by the local Pastoral and Agricultural Associations, and for championships for the winners of these, offered by the Royal Agricultural Society in three main districts, viz., the Riverina, the central west, and the north-west. The stimulus given to the whole movement by the Royal Agricultural Society's action has greatly increased the interest and usefulness of this work.

The districts in which competitions were judged this summer by officers of this Department number approximately forty, and the list, which follows,

affords some idea of the proportions to which the movement has grown and the widespread interest it has created. :—

Barellan.	Finley.	Narrandera.
Berrigan.	Forbes.	Narromine.
Bogan Gate.	Ganmain.	Oaklands.
Boggabri.	Gilgandra.	Parkes.
Boorowa.	Grenfell.	Peak Hill.
Condobolin.	Gundagai.	Quirindi.
Coolamon.	Gunnedah.	Tamworth.
Coonabarabran.	Henty	Trundle.
Coonamble.	Inverell.	Tullamoor.
Coradgery.	Lockhart.	Wagga.
Corowa.	Manilla.	Wellington.
Cowra.	Moree	West Wyalong.
Dubbo.	Murrumburrah.	Yanco.
Eugowra.	Narrabri.	Young.

It has become particularly noticeable to the judges of the competitions and to the journalists who accompany them (no mean judges of crops and farming methods) that there has been a very distinct improvement in farm methods in recent years as a result of these competitions. The reason for this advance is obviously that the methods of the best farmers in the district come under consideration and discussion, and receive wide publicity. The competitors themselves, too, receive direct benefit in the information given by the judges, and are stimulated by the very fact of the competition to do their best and to adopt every method that will contribute to success.

The great educational value of the competitions is particularly apparent at Wagga, where they have been in existence long enough to have a marked effect on local farming methods. As a consequence the standard of farming in that district is beyond doubt very much higher than in any other in the State. The homes of the farmers and the general condition of the farms are both striking testimony to the prosperity of the district, while the town of Wagga itself is one of the most progressive in the wheat belt of this State.

The competitions are also of very considerable advantage to the Department in providing opportunities for the officers who act as judges to make extensive, yet close surveys of the crops, and also careful comparisons of all the methods adopted. In this way they are able to determine what generally are the methods that will give the best returns, and the varieties that will best suit various soil and climatic conditions.

In view of the large number of competitions judged by officers of the Department in the present season it is impossible to publish all the reports, but a selection has been made with the object of ensuring a representation of the conditions obtaining in most parts of the State.

THE PARKES, FORBES, TRUNDLE, AND CORADGERY COMPETITIONS.

H. BARTLETT, H.D.A., Senior Agricultural Instructor.

Full details of each crop entered for the series of competitions at the above centres have been published in the local press, but a reference to some matters of common interest among western wheat-growers may be made here.

The Parkes Competition.

Of the twenty-six entries received, twenty-four were submitted for inspection, with an average estimated yield of 33 bushels per acre. After very careful inspection, it was not possible to separate for first honours the crops submitted by Mr. W. W. Watson, of "Woodbine," Tichborne, and Mr. R. M. Kelly, of "Wirrocarra," Parkes.

Mr. Watson's crop was indeed a quality crop, which it was difficult to fault in any section of the award. It showed right through a close attention to all details affecting the production of the highest standard of wheat crop. The crop was the eighteenth grown on the land, the last being wheat in 1922. The land was mouldboard ploughed in June, 1923; springtoothed in September, February, April, and May; and sown on 12th May, with 60 lb. of graded seed treated with dry copper carbonate and accompanied by 60 lb. of superphosphate. It will be noted that the springtooth cultivator was the only implement used on the fallow, the soil being of rather a silty nature which sets readily if finely worked. The crop was remarkable for trueness to type and purity, and freedom from disease. Two varieties were included in the block, Gresley and Warden; the former being an even dense crop, slightly lodged in patches, and the latter somewhat uneven in density and height in one portion. The block promised to yield 38 bushels per acre of plump grain.

Mr. R. M. Kelly submitted two blocks for inspection—one being Turvey, which tied with Mr. Watson's for first honours, and the other Canberra, which was placed third. The former may be termed a bulk crop, which showed that close attention had been given to the preparation of the land, seeding and manuring. It was 5 feet 3 inches in height, dense, well headed, level and erect, and it presented a spectacular appearance. Like most Turvey crops it showed a slight mixture of other varieties, on account of lack of pure seed supplies. The crop was somewhat marred by small patches of take-all and scattered cases of foot-rot; the yield was estimated at 43 bushels per acre. The block of Canberra was also a wonderful crop for evenness and density, being about 4 feet in height. The heads, though somewhat short, were well filled, and the crop promised to yield 39 bushels. Both crops were grown in the same paddock, which has produced many crops, the last being wheat in 1922. An early springtooth cultivation was given in May, 1923, and the land was mouldboard ploughed in July 3 inches deep; harrowed

in August; springtoothed in September; scarified and harrowed in December and again in February; and sown with a combine on 5th May with 60 lb. of graded seed and 70 lb. of high-grade superphosphate per acre; the seed had been treated with dry copper carbonate. Harrowed three days after sowing. Any portion of the 400-acre paddock in which these crops were growing was worthy of entry in the competition, and the whole paddock is expected to average 12 bags per acre

Competitor.	Variety.	Estimated Yield.	Type and Purity.	Disease Freedom.	Evenness.	Cleanliness.	Condition and Appearance.	Total.
Maximum Points	... .	*	20	20	20	†	‡	...
W. W. Watson, "Woodbine"	Gresley and Warden	38	19	19	16	28	26	146
R. M. Kelly, "Wirrocarra" ...	Turvey	43	16	16	18	28	25	146
R. M. Kelly, "Wirrocarra" ...	Canberra	39	17	18	18	26	26	144
S. J. Plowman, "Emuvale" .	No. 137	36	18	19	17	28	24	142
J. R. Postlewaite, "Keilor"...	College Purple Straw	39	16	16	18	27	25	141
C. A. Milgate, "Rockvale" .	Marshall's No. 3 ...	40	15	18	18	29	19	139
S. J. Plowman, "Emuvale"	Canberra	34	18	·17	18	26	25	138
E. T. Boehm, Tichbourne .	Canberra	28	17	18	19	29	27	138
E. D. Clarke, "Langwarnor"	Onas	36	16	17	17	28	23	137
C. A. Johnson, "Wongalea" .	Hard Federation ...	35	16	16	19	27	24	137

*One point for each bushel of estimated yield.
†First crop, 24 points maximum; second crop, 25 points, third crop, 26 points; fourth crop, 27 points; fifth crop, 28 points; sixth crop, 29 points; over six crops, 30 points.
‡First crop, 24 points maximum; second crop, 25 points; third crop, 26 points fourth crop, 27 points; over four crops, 28 points

The Forbes Competition.

Of the twenty-three received, eighteen crops were submitted for inspection, the average estimated yield being 31 bushels per acre.

This competition brought to light the most perfect crops I ever inspected—those grown by Mr. H. E. Elliott, of Kelvin Grove, Forbes, on a property (adjoining his own) of which he had the use for one crop under a clearing lease agreement. Mr. Elliott submitted three entries, but when he realised how good the crops were, he generously offered to withdraw one so as not to monopolise the prizes. The remaining two entries filled first and second places.

The winning crop was Waratah, a variety that is the result of a cross made at Wagga Experiment Farm in 1907 between Hudson's Early Purple Straw and Gluyas Early. The seed was recently purchased from the Department.

The crop was 4 feet 6 inches in height, very dense, even and clean; true to type and pure, and free from disease. Considering the height and density of the crop, and the rough weather the crop had been subjected to, it was standing remarkablv well, only slight lodging occurring in patches. The yield was estimated at 42 bushels per acre.

Mr. Elliott's second placed crop was Minister, a crossbred produced by Mr. Pye, of Dookie Agricultural College, Victoria. The crop was shorter in the straw than Waratah, very dense, even and well headed, and promised a yield of 44 bushels per acre. Owing to rather mixed seed, 5 points were lost; otherwise it would have gained first place.

The crops were sown on new land, cleared early in 1923; sundercut ploughed in September, 1923; harrowed in December, again in January; disc cultivated early in March; sown with a hoe drill on 15th to 25th April, with 60 lb. of graded bluestoned seed and 75 lb. of superphosphate per acre. Being grown on new land, the crops were penalised 10 points in accordance with the award table.

Competitor.	Variety	Estimated Yield.	Type and Purity.	Disease Freedom.	Evenness.	Cleanliness.	Condition and Appearance.	Total.
Maximum Points	....	*	20	20	20	†	‡	...
H. E. Elliott, "Kelvin Grove" ...	Waratah ...	42	19	19	19	24	21	144
H. E. Elliott, "Kelvin Grove" ...	Minister ...	44	15	19	19	24	22	143
J. E. Larnach, "Innisfail"	Waratah ...	35	19	18	15	27	23	137
H. Green, "Kiora"	Canberra ...	31	19	17	18	25	25	135
T. H. Bray, "Vychan"	Waratah ...	33	18	18	19	23	23	134
R. J. Elliott, "Grovehill"	Canberra ...	32	17	17	18	24	24	132
T. R. Jones, "Birdwood"	Florence ...	29	14	19	17	26	26	131
W. E. Warden, "Pine Park" ...	Canberra ...	30	16	17	17	23	27	130

* † ‡ Maximum points under these headings the same as in the Parkes Competition.

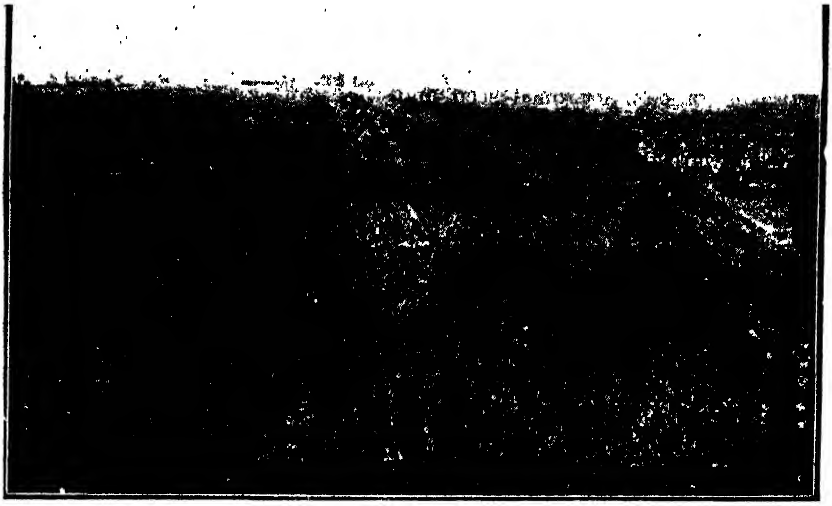
Trundle Competition.

Twenty-two crops were inspected out of a total entry of twenty-seven, the estimated average yield being 27 bushels per acre.

The first two positions were filled by Messrs. Mailer Bros.' crops at "Trundle Park," the best being an area made up with the varieties Canberra, Clarendon, and Hamel, grown in an old paddock, the last crop being wheat in 1921. The paddock was ploughed with mouldboard plough in August, 1923; springtooth cultivated in September and again in October; harrowed in April, 1924; disc cultivated in front of the drill, and the crop harrowed late in June; sown on 20th May with 60 lb. of graded seed treated with copper carbonate, and 70 lb. of superphosphate per acre. The crop had an average height of 4 feet, fairly dense and even, but it lost some points owing to some oats showing in the Hamel. Hamel showed a few strangers, but the other varieties were pure, and all were true to type and of pure seed standard.

Second place was filled by a crop of Gresley, which for months was the picture crop of the district. Being 5 feet 6 inches in height and dense, it presented a table-top appearance before lodging occurred in November. Some frosting in the centre of the block detracted from its condition, but the

balance of the area had filled remarkably well and promised to yield 11 bags. It was very true to type, and pure and clean. The paddock had been cropped for many years, the last being wheat in 1922, the stubble of which was grazed and burnt. The area was summer fallowed, being springtooth cultivated in February; 1923, mouldboard ploughed in July; springtoothed September;



Messrs. Mailer Bros. Crop, which won the Trundle Competition.

harrowed October and again in April, 1924; disc cultivated and sown on 6th May with 45 lb. of graded seed, treated with copper carbonate, and 70 lb. of superphosphate per acre.

Competitor.	Variety.	Estimated Yield.	Type and Purity.	Disease Freedom.	Evenness.	Cleanliness.	Condition and Appearance.	Total.
Maximum Points .. .	... .	*	20	20	20	†	‡	...
Mailer Bros., "Trundle Park"	Clarendon, Hamel, Canberra.	35	19	16	18	26	26	140
Mailer Bros., "Trundle Park" ..	Gresley	33	19	17	17	28	22	136
W. Berry and Sons, "Woodview"	Gold Top (Gluyas)	32	16	16	17	28	25	134
G. C. Little, "Darriwell" ...	Federation ...	29	18	15	16	29	25	132
A. H. Capel, "Mordialloc" ...	Canberra	30	12	17	15	30	25	129
Taylor Bros., "Prospect" . .	College Purple Straw.	31	11	15	16	29	26	128
W. Berry and Sons, "Woodview"	Federation ...	30	14	15	15	29	25	128
W. J. Sanderson, "Avilla" ...	Canberra	27	17	14	17	28	25	128
G. Simmons and Sons, "Grassdale."	Gluyas Early ...	33	9	17	18	26	24	127

* † ‡ Maximum points under these headings the same as in the Parkes Competition.

The Coradgery Bureau Competition.

Coradgery branch of the Agricultural Bureau is ever to the fore in matters of this kind, and for the crop competition eleven entries were received and judged, the average estimated yield being 29½ bushels per acre.

The crop of Hard Federation exhibited by Mr. W. E. Tayler, of "Adavale," filled first position. It was 3 feet 9 inches in height, fairly dense, even, very true to type and pure, almost free from disease, clean, standing exceptionally well, and promising to yield 32 bushels per acre. It was grown in an old paddock, the last crop being wheat in 1922. The land was mouldboard ploughed in June, 1923; springtooth cultivated in February; and sown with a combine on 16th May with 50 lb. of seed, treated with dry copper carbonate, and 40 lb. superphosphate per acre.

Mr. A. Milgate's crop of Marshalls' No. 3, which filled second place, was an exceptionally heavy crop which had lodged considerably, nearly 3 feet high, dense, very clean, even, and almost free from disease, but dropped a number of points for defects in purity of type. Frosting in patches also detracted from its condition; but it was estimated to yield 40 bushels per acre. It was grown on an old paddock, the last crop being oats in 1920. The land was mouldboard ploughed in September, 1923; harrowed in February, 1924; harrowed in April; sown with a combine, and harrowed three days after sowing; sown 29th April to 5th May, with 45 lb. graded seed, treated with copper carbonate, and 45 lb. of superphosphate per acre.

Competitor.	Variety.	Estimated Yield.	Type and Purity.	Disease Freedom.	Evenness.	Cleanliness.	Condition and Appearance.	Total.
Maximum Points	....	*	20	20	20	†	‡	...
W. E. Tayler, "Adavale" ...	Hard Federation	32	19	18	18	28	26	141
A. Milgate, "Rochvale" ...	Marshall's No. 3 ...	40	15	18	18	29	19	139
W. Woods, "Rosedale"... ...	Turvey	35	15	14	17	29	26	136
A. Milgate, "Rochvale" ...	Canberra	29	16	18	17	29	23	132
T. Tanswell, "Fernleigh" ...	Canberra	28	18	19	17	25	22	129
C. Tanswell, "Braeside" ...	Canberra	26	17	17	17	28	24	129
W. E. Tayler, "Adavale" ...	Gresley and Improved Steinwedel.	29	18	17	15	28	21	128

* † ‡ Maximum points under these headings the same as in the Parkes Competition

The Season.

Good rains falling during June and July, 1923, enabled the land for the fallows to be ploughed in ideal condition. Favourable rains for working the fallows were delayed till the end of October, when generally the farmers seized the opportunity of putting the fallows in order in view of the summer. The rainfall was then patchy and light till the middle of February, when

storms made it possible to place the seed bed in order. The month of March, 1924, was very dry, but good rains falling during the second and third weeks of April caused a good strike of weed seeds, and the most was made of this opportunity to destroy the growth by cultivation before sowing the wheat. The latter end of April and May were favourable for sowing, nearly all farmers having finished before the rains early in June.

The rains during the growing period were ample, but temperatures were rather mild. An absence of frosts in June and July encouraged rather too much growth, while late frosts in September and early October affected some patches of crop situated in depressions. Excessive rains and mild temperatures were recorded in September, which made conditions favourable for the development of the wheat leaf blight fungus. October was a favourable month, but November was one of anxiety as frequently recurring and heavy storms tended to depreciate the value of the heavy crops.

Summed up, the season has been very favourable, and there is a possibility at the time of writing of a crop nearly approaching a record being harvested.

RAINFALL.

Month.	Parkes Post Office.	Forbes Post Office.	Trundle Post Office.	Coradgery "Rosedale."
Fallow Period, June, 1923, to April, 1924.				
1923.	Points.	Points.	Points.	Points.
June	466	386	310	387
July	346	251	197	213
August	92	81	69	67
September	133	246	100	51
October	245	140	198	182
November	254	97	110	132
December	83	98	72	40
1924.				
January	70	80	41	55
February	307	211	100	207
March	Nil.	69	21	Nil.
April	246	220	133	213
Total	2,242	1,879	1,351	1,547
Growing Period, May to 8th November.				
May	66	37	76	91
June	243	167	195	211
July	229	218	164	264
August	193	216	178	171
September	426	398	292	405
October	133	149	133	169
November 8th	228	160	186	270
Total	1,518	1,345	1,224	1,581
Grand Total	3,760	3,224	2,575	3,128

The Use of Superphosphate.

Every competitor in the Parkes competition applied superphosphate to his crop, the average amount working out at 54 lb.

Of the eighteen crops in the Forbes competition, fourteen were manured with superphosphate at the average rate of 53½ lb. per acre. Two unmanured crops were on old land, and two on new land.

All the twenty-two entries in the Trundle competition had been aided with superphosphate at the average rate of 50 lb. per acre.

Of the eleven crops in the Coradgery competition, ten had been manured at the average rate of 42 lb. per acre.

In all centres the quantities varied from 30 to 90 lb. per acre, but the greatest number of crops were manured at the rate of from 45 to 60 lb. per acre.

This indicates a marked change from the position of three years ago, when the question generally asked was—"Do you advise me to use manure?" To-day the question is, "How much can I safely apply?"

And here a note of caution is not out of place. Extremes must be avoided, as excessive quantities will depress yields, producing too dense and flaggy a growth, small ears, and a crop liable to lodge. But the question, what is an excessive quantity, has yet to be determined for this western district. It is only three years since superphosphate commenced to be generally used, and it was first used in such small quantities as to act more as an irritant than a stimulant. It is only in the past season that a respectable helping has been given to the wheat plant, though a few gave a banquet allowance, using up to 90 lb. per acre. The "excessive" quantity was probably safe this year, but the advice is to "go easy" and work up by small quantities. Superphosphate will ripen a crop early; and if judiciously applied is economical as far as the available moisture is concerned, but we must avoid a crop development of 10 bags if the moisture available will only mature 8 bags.

At the present time a safe recommendation for use on well-worked fallow is 60 lb. per acre. In special cases, with a full knowledge of requirements, 70 lb. is safe. Any quantities above this must be treated in the way of an experiment. Excessive quantities of superphosphate will produce tall, coarse-stemmed, flaggy plants, if the seeding is thin, and it will aid lodging. Very heavy seedings will also induce lodging, but the two combined will have a worse effect than the last straw had on the camel.

Experiments have been established throughout the district to determine the most suitable quantity of superphosphate to apply per acre, amounts ranging from 32 lb. to 84 lb. being used, so within three or four years we should have a good guide as what is the maximum safe limit.

Superphosphate will certainly promote increased root development, growth, and stooling, but it is not wise to apply more than a safe quantity in an endeavour to counteract a reduced seeding. What we have to determine is the maximum safe limit of seed and manure combined that can be economically used.

Seeding.

The average amount of seed per acre used in the Parkes competition was 52 lb.; in the Forbes competition, 59 lb.; in the Trundle competition, 49½ lb.; and in the Coradgery competition, 51 lb. The amount of seed sown per acre must necessarily vary according to the district, the time of sowing, and the variety. However, there has been a general tendency for the amount to increase, due mainly to the improvement in the preparation of the fallows making thick crops safer than in former years. Later seeding has also certain definite advantages, and when that is the practice the seeding naturally needs to be heavier. Other things being equal, seedings may be reduced 5 lb. per acre when the dry treatment of seed for bunt prevention takes the place of the wet treatment. At the present time the seeding seems to be in accordance with requirements. Experiments already commenced will within a few years indicate if an alteration in the seeding is desirable.

Seed Treatment.

In these competitions growers treated their seed as follows:—

Competition.	No Treatment.	Dry Treatment (Copper Carbonate).	Wet Treatment (Bluestone Solution)
Parkes	...	10	12
Forbes	3	1	14
Trundle	2	10	10
Coradgery	...	9	2

In 1923, experiments were established in three centres to test the dry treatment with copper carbonate powder against the wet treatment with bluestone, and the results were very successful. The plots were really demonstration areas, as the Department had already proved the success of the dry treatment. It is pleasing to note the confidence the farmers showed in the Department's recommendation, as 40 per cent. of those in the competitions used the dry treatment. Its success has been most pronounced, and the unanimous opinion is that the wet treatment will not be heard of in a few years' time. Besides giving a higher percentage and quicker germination, the crops are more even and promise to yield better by several bushels. All the crops so treated were practically free from bunt.

The untreated seed, except in one instance, was Florence—a very bunt-resistant variety, which is seldom treated.

The Varieties Used.

The following table shows the varieties and the number of crops of each variety exhibited at each centre :—

Variety.	Parkes.	Forbes.	Trundle.	Condobolin.
Gresley	1	3	2	1
Warden	1	...	...	...
Turvey	3	...	...	1
Canberra	8	6	5	5
College Purple Straw	3	...	1	...
Marshall's No. 3	1	...	...	1
Onas	3	...	...	...
Hard Federation	2	2	5	1
Lotz	1	...	1	...
Ball's Early	1	...	...	...
Penny	1	...	...	...
Waratah	...	3	...	...
Minister	...	2	...	...
Florence	...	2	2	...
Federation	...	2	2	2
Clarendon	...	...	2	...
Hamel	...	...	1	...
Gold Top (Gluyas)	...	...	5	...
Caliph	...	...	1	...
Improved Steinwedel	...	...	...	1
No. 137	1	...	...	...

The table brings prominently to light the rather surprising number of varieties that are grown within a comparatively small compass—an area with a radius of less than 30 miles, where the climatic conditions are very similar, though the soil types vary. Other varieties are also grown in this area that were not exhibited.

Reference may be made to a paper appearing in the *Agricultural Gazette* of September, 1924, discussing the excessive number of varieties grown in this district; and the statement may again be made that farmers are losing money by not eliminating the lesser yielding sorts, and concentrating upon seed improvement of the better varieties. The varieties named in the table may, for all practical purposes, be divided into three classes, those in each class serving the same purpose. Farmers or, better still, groups of farmers, are advised to select the most suitable variety of each class, to sow that one in its proper season, and to discard the balance. The three classes would be made up as follows :—

(1) Canberra, Gresley, Ball's Early, Florence, Clarendon, Hamel, Improved Steinwedel, No. 137, Hard Federation, Gluyas (Gold Top).

(2) Federation, Onas, Waratah, Caliph, College Purple Straw.

(3) Turvey, Marshall's No. 3, Warden, Lotz, Penny, Minister.

To the above the following varieties grown in the district, but not included in the competitions, may be added :—

(2) Bald Knob, Union.

(3) Wandilla, Yandilla King.

The most popular variety is still apparently Canberra, of which nothing further need be said. Some exceptionally fine crops of Turvey were grown in the Parkes district, and no doubt its success will lead others to grow it, especially as it gained first and second places in the championship competition. It withstood weather conditions exceptionally well and produced heavy yields. Being a late maturing wheat, it should be above ground by the end of April, and sowings must be made accordingly. This year conditions favoured Turvey. The behaviour of Federation and Hard Federation was most disappointing. Dense, well grown crops fail to fill up to expectations, and it seems that this type of wheat must slip in favour of the more consistent yielding wheats.

Gluyas (Gold Top) is perhaps the most popular wheat in the Trundle district, but the introduction of pure selected seed is most desirable.

Two crops of Minister were inspected at Forbes, one being an exceptional crop produced by Mr. H. E. Elliott, which will yield over 14 bags per acre. It has excited much interest, but it is as well to remember that the season was most favourable to it, and to treat it as a variety new to the district.

The outstanding variety of recent introduction is Waratah. In the dry years of 1921, 1922, and 1923, it yielded well in the drier centres of the south-western district. Trials were made in 1922 and 1923 in the western district and through poor germination, owing to seed-treatment damage, the yields were light, but the behaviour of the plants attracted attention. The three crops inspected at Forbes were particularly pleasing, being dense, well grown, well filled, and standing remarkably well. The behaviour of Waratah in the several experiment plots in the west this year is excellent. This variety is recommended for general trial, with the object of displacing some of the wheats in class 2. Gresley gave some rather attractive crops, but the matter of its replacing Canberra in any centre is still doubtful.

Cultural Methods.

In the Parkes competition twenty-three crops were grown on fallowed land, which was worked on an average three to nine times, not including the ploughing of the fallow or the drilling of the seed; the use of a combine is counted as a working. One crop was grown on stubble land. Four fallows were summer fallows, *i.e.*, cultivated prior to ploughing. Sixteen fallows were ploughed with the mouldboard plough, and five with the disc plough. Five fallows were cultivated fallows, *i.e.*, not ploughed. Two areas were ploughed with a disc and a mouldboard plough.

In the Forbes competition, seventeen crops were grown on fallowed land, which was worked on an average three to eight times. One crop was grown on stubble land. No fallows were summer fallowed. Seven fallows were ploughed with the mouldboard plough, and ten with the disc plough. None of the fallows were cultivated fallows.

In the Trundle competition, seventeen crops were grown on fallowed land, which was worked on an average three times. Five crops were grown on stubble land, and two fallows were summer fallowed. Fifteen fallows were ploughed with the mouldboard plough, two with the disc plough. No fallows were cultivated fallows.

In the Coradgery competition, all the crops (eleven) were grown on fallowed land, which was worked on an average three to five times. No fallows were summer fallowed. Nine fallows were ploughed with the mouldboard plough and two with the disc plough. No fallows were cultivated fallows.

SUMMARY of the Four Centres.

Crops grown on fallow	68	
" stubble	7	
		75
Number of times fallows worked (excluding ploughing and seeding)		3 to 6
Number of summer fallows		6
Number of fallows ploughed with mouldboard plough		47
" " disc plough		19
Number of cultivated fallows		5

The table shows that 91 per cent. of the exhibited crops were grown on fallowed land. That the working of the fallows had generally been efficient (as the number of three to six workings, plus the ploughing and seeding, indicates) means that the ground had been covered with implements nearly six times. Summer fallowing is not yet widely practised, but is gaining headway. This is a sound system and can be recommended. Mouldboard ploughs are more popular than the disc ploughs.

Cultivated fallows are not recommended, except for special classes of land —perhaps of the self-mulching types—but more has yet to be learnt with regard to this practice.

For fuller details of cultural methods recommended, reference may be made to the paper appearing in the *Agricultural Gazette* of August, 1924, entitled " Fallowing in the Central-western Districts."

Diseases.

The well-known wheat diseases were fairly widely spread, but did not appear in sufficient density to seriously affect the yields. Flag smut appeared early in September and gave rise to some concern; but the favourable growing season developed the healthy plants so strongly that spaces left by diseased plants were covered over—plant food and moisture having been diverted to the healthy ones—and the infection was hardly noticeable at harvest. Take-all and foot-rot took their normal toll, but the crops were particularly free of bunt. Loose smut was more in evidence than in former years, and this may be attributed to the hot drying conditions at flowering time in 1923. Wheat-leaf blight (*Septoria tritici*) rather seriously affected some crops (more so than in any previous year), and is attributed to the moist cool weather of September. The destruction of the flag caused a premature drying of the plant, resulting in pinched grain. As the disease is seasonal in occurrence the trouble may not appear again for several years.

Type and Purity.

There is a marked improvement in the type and purity of the crops of this district, no doubt due to the publicity given to the value of pure seed, and directly due to the establishment of pure seed areas. Pure stud seed not only eliminates inconvenience at harvest, due to late maturing "strangers," but gives to the crop a uniformly large ear development and even growth. After the 1925 harvest, the western district will be well supplied with pure stud seed of the varieties desired, through the medium of the pure seed growers.

THE COOLAMON COMPETITION.

E. S. CLAYTON, H.D.A., Agricultural Instructor.

This is the first competition of the kind held in the Coolamon district, and the fact that twenty-nine entries were received is an indication of the progressive spirit of the farmers, and speaks well for the future of the competitions. The areas under crop ranged from 100 to 1,000 acres; in all 11,560 acres of crop were inspected.

With the exception of some of the land sown with oats, practically the whole of the 11,560 acres inspected was on fallowed land, and judging was rendered difficult by the general excellence of the crops.

The Winning Crops.

All the crops on Mr. Lawrence's farm presented a very even appearance, and the seed was true to type. The crops were well grown, dense, and clean. The farm owed its superiority chiefly to its freedom from disease. The area of wheat inspected on this farm was 345 acres. It was sown at the rate of 80 lb. of seed and 95 lb. of superphosphate per acre. Turvey, Federation, and Warden were the varieties grown. No oats were sown.

Mr. Lawrence believes in thorough working of his fallows, early sowing, and heavy dressings of seed and fertiliser. These crops were heavier and denser than most of the others seen during the judging. This was one of the few farms where no trace of take-all or foot-rot was to be found. This freedom from disease is chiefly attributed to the system of clean fallowing practised and to the heavy dressings of superphosphate. The frequent cultivations of the fallow destroy all weeds, grasses, &c., on which the fungous diseases may exist. A point not fully realised by many farmers is the fact that keeping a fallow heavily stocked with sheep so that weeds or grasses cannot make any growth is not sufficient to rid a paddock of take-all and foot-rot, as the fungus may still exist on the butts and roots of the grasses. Cultivation is necessary in addition to sheep if the fungus is to be starved out.

Mr. Lawrence cultivates his fallows frequently, and the crops were wonderfully free from undergrowth, black oats, and weeds. The only implements used on the fallows are harrows and the springtooth cultivator. The

winning crop was Turvey. It was particularly dense, heavy, even, and clean, and was estimated to yield 34 bushels per acre. Ten inches of rain was received during the growing period of the crop.

Mr. Langtry's crop totalled 900 acres, all sown on fallow. The varieties were Turvey, Yandilla King, College Purple, and Baroota Wonder; 300 acres of oats were sown. Sowing commenced on 8th April and was continued up to 9th May, so that all the crop was sown early. The fact that the whole 900 acres of crop was on fallowed land demonstrates Mr. Langtry's knowledge of the value of fallowing. He is to be congratulated on the cleanliness of the farm, more especially as some of the paddocks have been under cultivation for well over thirty years.

The total area of the farm is 1,573 acres, and the property is practically free from black oats, thistles, &c. It is really remarkable that such a large area of crop and fallow can be kept so clean, and furnishes striking evidence of the possibility of freeing the whole district of wild oats and weeds. The crops were dense and even, and were estimated to yield 27 bushels per acre over the whole 900 acres. The rainfall for the growing period was 13 inches.

Fallowing commenced in June; the harrows and springtooth cultivator were used when required—no disc implement is put on the fallows. The wheat was sown at the rate of 70 to 80 lb., and superphosphate at 60 to 90 lb. per acre.

Mr. P. Maloney has a total area of 1,704 acres, the area under crop being 520 acres. This comprises 60 acres of Guyra oats, 60 acres Algerian oats, and 400 acres of Turvey wheat. The bulk of this land was fallow. Seeding commenced on 1st April and was completed by 20th May, the wheat being sown at the rate of 55 lb. per acre. The land had been ploughed early, springtoothed once, disced once, then springtoothed, rolled with spiked roller, drilled, and rolled again. This method of cultivation is quite unusual, but the results were certainly surprising. The germination throughout was excellent and the crops were dense, even, and very heavy. Considering that the land had previously grown in the vicinity of twenty-five crops, the paddocks were wonderfully free from wild oats. The 50-acre crop of Turvey, which came second in this competition, presented an excellent appearance and was estimated to yield 33 bushels per acre.

Mr. Maloney pins his faith on Turvey; no other variety was grown on the farm. The crop received a dressing of 70 lb. of superphosphate per acre.

General.

The district embraced by this competition forms portion of the safest hay-growing district of the State. The chaff from this locality is famed for its uniform high quality. Practically no undergrowth was noted in any of the crops, a point of great importance in hay quality. The crops are tall and clean, and in normal seasons cut from 2 to 3 tons of excellent hay pe

acre, and even the heavy dressing of superphosphate used on the soil does not seem to have the effect of stimulating the growth of clover in the stubble, as happens in other localities. This is a remarkable feature. In the portions of the district where heavier soils are to be found the crops are equally tall, but the superphosphate has had the effect of increasing the growth of clover in the crops, and while these crops are just as heavy as those grown on the lighter land they are not quite so free from undergrowth. This, however, is not a serious disadvantage by any means, as the growth of clovers in the stubble renders them much more valuable from a grazing and fertilising point of view.

During the inspection crops of Turvey, Yandilla King, Baroota Wonder, College Purple, Warden, Minister, Lotz, Purple Straw, Bomen, Florence, Marshall's No. 3, Canberra, Penny, Waratah, Major, Federation, Firbank, Sanger's Prolific, Gallipoli, Currawa. Champion, Gresley, and one of so-called Improved Federation were seen.

Turvey and Yandilla King were by far the most popular varieties in this locality. Both are excellent dual-purpose wheats, and are apparently suited to the Coolamon district. A preference is shown for Turvey in the southern and western areas, with Yandilla King as the favourite with the growers of the northern and eastern parts, while dual-purpose varieties are chiefly favoured on account of the large local production of hay; the tendency of late years has been the cultivation for grain of small areas of early maturing varieties, such as Waratah, which can be sown later in the season after the seeding of the hay varieties has been completed. Although quite a number of crops of Florence were seen, only one could be called good; this was on Mr. O'Brien's farm. This variety is not recommended for the Coolamon district, and could advantageously be replaced by Waratah.

The type of seed used was found to be generally good, but many farmers do not yet pay sufficient attention to the procuring of clean, true-to-type, stud seed. The crops seen on the farms of Mr. C. T. Dixon and J. F. Gaynor were very true to type, and were practically free from strangers. Many crops showed a good deal of flying smut. It should be remembered that pickling is useless in preventing this disease. The only practical way of combating flying smut is to select seed from a crop that is free of it.

The Oats.

Algerian was the principal variety grown, the only other oat seen being Guyra. While Algerian is an excellent variety both for hay or grain, farmers should be more familiar with the early-maturing sorts now available. These varieties, by reason of their early maturity, are particularly suitable to the wheat-grower's requirements, as they can be sown and harvested at a more convenient time than late-maturing varieties, such as Algerian. For the Coolamon district Sunrise and Mulga can be confidently recommended for trial.

All the oat crops inspected were more or less infected with loose smut. In some the yield was seriously reduced by this disease. Loose smut of oats is related to the loose or flying smut of wheat: and the bluestone treatment for stinking smut or bunt of wheat is not an effective treatment for oats unless the seed is soaked for a prolonged period, which of course is likely to interfere with the germination. Oats are best treated by spraying with 1 per cent. formalin solution, then covering with a bag and allowing to remain for four hours. It is advisable to sow shortly afterwards in a moist seed-bed. If possible seed should be obtained from a crop free from oat smut, though it is always advisable to pickle all oats sown in this district.

The points scored by the leading crops were as follows :—

—	Apparent yield.*	Trueness to type. (Max 20.)	Freedom from disease. (Max. 20.)	Evenness. (Max. 20.)	Cleanliness and cultivation.†	Condition and appearance.‡	Total points.
			Best Farm of Growing Crops.				
W. Lawrence ...	28	18	18	19	27	27	137
J. I. Langtry ...	27	18	16	18	29	28	136
P. J. Maloney ..	30	18	16	20	25	26	135
P. Bradley	28	18	16	18	24	26	130
J. Warren	28	18	14	16	27	27	130
J. F. Gaynor	27	19	18	19	24	23	130
			Best 50 acres of Crop.				
W. Lawrence ...	34	18	18	20	28	28	146
P. J. Maloney ...	33	18	17	20	27	28	143
J. I. Langtry ...	32	18	16	19	29	28	142
J. Warren	33	18	15	18	27	27	138
P. Bradley	32	18	15	19	27	26	137
P. O'Brien	35	18	16	19	26	23	137

* One point for every bushel of wheat, every 1¼ bushels of oats, and every 1¼ bushels of barley.
† First crop, 24 points; second crop, 25; third crop, 26; fourth, 27; fifth, 28; sixth, 29; over sixth, 30 points.
‡ First or second crop, 24 points; third or fourth, 25; fifth or sixth, 26; over sixth, 28 points.

THE MANILLA COMPETITION.

MARK H. REYNOLDS, H.D.A., Senior Agricultural Instructor.

The crops of sixteen farmers were inspected in the crop-growing competition organised this season by the Manilla branch of the Farmers and Settlers' Association, that of Mr. W. E. Kirk (Florence) winning first place.

The principal deficiency in the winning crop was in relation to type. The seed was brought into the district some years ago and spread from farm to farm, with no attempt at selection to keep it true to type, the result being that there are many types, and it was difficult to decide whether to call it Canberra, Florence, or any other named early variety. Points were also lost for deficiency in evenness of height, a natural consequence of the lack of trueness to type. Otherwise the crop was of good density and vigour,

free from bunt and ill-effects of any other disease, of a safe height and good balance of ear to straw. There were few weeds in the stubble, and the field was virtually free of tall weeds, such as oats.

The land had been sown in 1923 to wheat, which failed to produce sufficient grain, and was fed off. The crop under notice was the fourteenth. The section has been cultivated for sixteen years and no fertiliser has been added at any time. Cultivation for this crop consisted of a 4-inch ploughing during the first week of January, a 3-inch cultivation with a one-way disc cultivator in May, and a harrowing at the latter part of the month, when the seed was drilled in at the rate of 50 lb. per acre. The seed had been graded and dusted with a proprietary copper carbonate at the rate of 2 oz. per bushel. The rainfall during growth was as follows :—June, 172 points; July, 263; August, 137; September, 218; October, 104; total, 894 points.

The crop was especially worthy in that it was not located on the best position or slope, and was on comparatively level country.

Mr. J. R. Haywood's crop of Canberra was marred by a sprinkling of bunted heads; in other respects it was the best all-round crop in the contest. The comparative freedom from strangers and its trueness to type were noteworthy, likewise its freedom from other diseases than bunt. When inspected, the crop was almost mature, standing up well, and with only rare wild oats or other weeds.

The soil is the typical light red loam of the district, overlying a clay subsoil, and the crop was situated on a gentle slope. The land has been cultivated for eighteen years, the present being the sixteenth crop of wheat. A crop of wheat was taken off in 1923. Cultivation consisted of a 3-inch springtooth cultivation the latter part of December to the first week in January, a similar cultivation 2 inches deep at the end of January, a cultivation with the combine (a tine seeder) early in March, and a ploughing 4½ inches deep the latter part of March and in the middle of May. Seeding was carried out with a combine directly after the ploughing, graded seed which had been treated with a proprietary copper carbonate being used. Apparently the seed was thoroughly dusted, but whether sufficient powder was used is doubtful. Superphosphate at the rate of 40 lb. per acre was applied with the seed on a portion of the land. The rainfall during the growing period was as follows :—June, 223 points; July, 337; August, 216; September, 256; October, 112; total, 1,128 points. The proximity of a range of high hills was apparently responsible for the difference in precipitation here and on Mr. Kirk's crop.

The three varieties—Marshall's No. 3, Florence, and Hard Federation—with which Mr. W. A. Bomen competed, were all of good type and comparatively free from admixture with other varieties. During the last couple of years pure seed has been obtained from the Department's experiment farms, and other farmers would do well to obtain better type seed than they are now growing.

The Florence and Hard Federation was situated on somewhat level country, and the Marshall's No. 3 on a sloping situation. The soil is a red loam, The land was first cultivated twenty years ago; since then fifteen wheat crops have been grown on this section.

A 2½-inch springtooth cultivation early in December was followed by a considerable weed growth, and the land was skim-ploughed 2½ to 3 inches deep at the latter part of January on the Marshall's No. 3 section, and one-way disced 3 inches deep on the balance; harrowed in February, and the seed sown with a drilling machine the third week in April. No fertiliser was applied. On 30th October, when the crop was inspected, the Florence and Hard Federation were taking on a golden colour, and comparatively safe. Marshall's No. 3 was still in the green stage.

The seed was graded, and, with the exception of Florence, which was not treated in any way, was machine-dusted with a bunt preventive. There was a small sprinkling of bunt in the Marshall's No. 3, and rare infected plants in the Florence.

The rainfall was as follows:—May, nil; June, 105 points; July, 18; August, 153; September, 276; October, 87; total, 639 points.

DETAILS OF AWARDS.

Competitor.	Variety.	Apparent Yield.*	Type and Purity Max. 20.	Freedom from Disease Max. 20.	Evenness. Max. 20.	Cleanliness.†	Condition and Appearance.‡	Total Points.
W. E. Kirk ...	Florence	32	10	20	16	28	25	131
J. R. Haywood ...	Canberra	33	18	12	16	26	25	130
W. A. Bomen ...	Florence, Hard Federation, and Marshall's No. 3	30	18	14	16	27	22	127
H. Rogers	Canberra	31	13	17	16	23	24	124
A. P. Cummins ...	Currawa	34	16	13	19	22	18	122
T. P. Freestone ...	Canberra	26	15	18	15	21	23	118
G. L. Porter ...	Dr. ophead, Federation, and Rymer.	36	13	10	15	23	19	116
H. Rogers	Hard Federation ...	31	16	8	16	22	22	115
Colvin and Watt ...	" " ...	30	12	16	15	23	18	114

* One point for each bushel of apparent yield.
† Maximum Points.—First crop, 24 points; an additional point when cropped each year up to the sixth crop; over the sixth crop, 30 points.
‡ Maximum Points.—First and second crops, 24 points; third and fourth, 25 points; fifth and sixth, 26 points; over six crops, 25 points.

There is need for better-quality, true-to-type seed, for an increased area to fallow, and an occasional cropping with oats to minimise the risk of foot-rot and take-all, the effects of which diseases are at present noticeable in many crops in the district.

THE GILGANDRA COMPETITION.

B. M. ARTHUR, H.D.A, Agricultural Instructor.

With the probable return to a looked-for run of good seasons, and the presence of many high-yielding crops throughout the district, this year's competition, with a total of twenty-four entries, was an undoubted success, and great interest was evinced throughout by all competitors. The majority f the crops submitted showed distinct appreciation of the advantages to be gained by the adoption of better farming methods, including fallowing, the selection of good seed, and the increased use of fertilisers.

The Season.

The season, though good towards the latter end of the growing period, was not altogether an ideal one during the early part of the year for the working of the fallows to the best advantage for the pre-germination of weed pests and fungous spores in the soil, and the preparation of a good seed-bed. Good rains during April enabled seeding of late maturing varieties to commence, but a dry May caused doubt as to the advisability of further sowings, while in many localities grasshoppers caused considerable havoc to many of the young growing crops, making re-seeding necessary in several cases. Light but useful rains during June and July brought about good germination and early growth, but intervals of three weeks or more between rains was just long enough in some cases to give the crops a slight check, which must ultimately have been reflected in the yields.

Rainfall records during fallowing and growing periods.

	Gilgandra P.O.	Biddon	Tnglands.	Carban.	Bearbong
Fallowing period.					
1923—	points.	points.	points.	points.	points.
July	143	167	......	......	207
August ...	43	60	......	......	64
September ...	186	182	......	......	223
October ...	121	88	......	......	95
November ...	164	108	......	......	153
December ...	627	542	......	......	538
1924—					
January ...	48	67	90	60	90
February ...	171	157	147	146	157
March ...	18	4	0	0	4
April ...	122	226	163	193	265
Growing period.					
May	18	16	20	0	18
June	179	145	147	163	165
July	203	142	195	144	127
August ...	121	83	129	75	115
September ...	419	291	338	339	349
October ..	228	247	139	252	189

The Winning Crops.

The prize-winners were :—Messrs. Beveridge Bros., "Tuglands," Gilgandra, 1; Mr. G. R. Altmann, "Spring Creek," Gilgandra, 2; Mr. V. Barden, "Woodside," Bearbong, 3.

The winning crop of Yandilla King, grown by Messrs. Beveridge Bros., was portion of a 200-acre paddock, all of which was uniformly good and wonderfully free from weed growth. The land was fallowed in April, 1923, with a disc-plough, again ploughed in September, springtooth cultivated in January and February, and one-way disced in May. It was sown early in May with 40 lb. graded seed and 60 lb. superphosphate.

This crop was extraordinarily free from weed growth, very even in height and density, fairly free from disease, and only showed a trace of foot-rot and flag smut. But there was considerable room for improvement in the type of seed; there were many mixtures of different periods of maturity and height, adding to the difficulty of harvesting and probable loss by shelling.

The second crop, of Gresley and Penny, grown by Mr. G. R. Altmann, was also a good competition crop, being very clean, disease-free, and even, and standing up well, the varieties also being very true to type. It was grown on a fallow which was springtoothed in June, disc-ploughed in September, harrowed in October, and springtoothed in January. It was sown the first week in May with a combine, using 60 lb. graded bluestoned seed and 70 lb. superphosphate.

The third crop, of Canberra, grown by Mr. V. Barden, was also high yielding, but lost points for cleanliness owing to the presence of many wild oats, Mexican poppies, and Shepherds' Purse. The land was rich, being on the edge of a creek. It was fallowed with the disc plough in July-August, disc-cultivated October, springtoothed January, and disced early in May. It was drilled in mid-May with 49 lb. graded bluestoned seed. No manure was used.

Fallowing.

Of the twenty-four entries, twenty were grown on fallowed land, and the first ten places were gained by competitors who had fallowed at different periods, varying from April to November. This points to the fact that farmers are beginning to realise the many advantages accruing from the early working of the soil, including the extra conservation of moisture, and the better control of weed pests and fungous diseases, to say nothing of the more even distribution of work for both man and animals.

Fertilisers.

Eight out of the twenty-four crops were fertilised with superphosphate, and among these were the first and second prize-winners, who used 60 and 70 lb. respectively. Several other competitors also experimented with varying amounts in strips throughout their crops, and the results obtained were so markedly in favour of the manured areas that regret was expressed that more

confidence had not been placed in its use. Superphosphate is applied to a crop not so much with the idea of increasing the fertility of the soil, as of forcing an early germination in the first instance, and later on vigorous growth due to a larger and deeper rooting system, and a consequent earlier maturity. It is fairly safe to state that beneficial results will in most seasons be obtained from the application of reasonable amounts of superphosphate to crops sown on fallowed areas, which should have the necessary reserve of moisture in the event of a dry period or lack of natural precipitation, and all farmers are recommended to experiment in this direction with the object of increasing their yields and financial returns.

Seed.

The amount of seed used varied from 30 to 70 lb. It was mostly graded and treated with a fungicide. In this direction there is plenty of room for improvement, as the seed, though mostly true to the type it represented, in many cases showed a large proportion of strangers of varying heights and maturity, thus adding to the difficulties of harvesting and possible loss by shelling and the missing of low-growing ears. These factors all tend to reduce the yields obtained, and a supply of well-graded pure seed will amply repay the grower for the extra trouble and cost involved. Graded seed, with the elimination of small grains, will also tend to give a more even crop in density and height.

Diseases.

Although no crop seen was totally free from fungous diseases, the majority were comparatively free from these destructive troubles. Bunt or stinking smut was found to be present to a greater or lesser extent in many crops, especially those where steps had not been taken to treat the seed. This disease can be absolutely controlled by the use of any of the known fungicides if due care is taken to remove whole unbroken bunt balls, and to see that reinfection does not take place; but where dusting with dry copper carbonate is practised no reinfection is possible, as the action of this treatment only takes place in the soil after sowing, while germination is also better, as there is no injury to the seed. In support of this contention it is pleasing to note that where copper carbonate was used by competitors no trace of stinking smut was to be found.

Flag smut and foot-rot were also fairly prevalent. Methods of control for these fungous diseases are the early burning of stubbles, the frequent working of the land when moist, in order to pregerminate the fungus spores, and, where the infection is bad, the rotation of an oat crop, which is not subject to these diseases.

Rust was not present to any great extent, and the damage done by this disease was negligible. Powdery mildew put in an appearance at the latter end of August, but unfavourable conditions for its development from then on precluded the possibility of any material damage in this direction.

Conclusion.

It is to be hoped that competitors may benefit by their experience in submitting their crops for inspection, and that attempts will be made towards improvement where possible in relation to the various factors which go to make up a successful competitive crop—not only with the idea of doing better in future crop competitions, but of raising the general standard of the crops and the district yield. If this is accomplished the individual will benefit, and the Gilgandra district will receive a boost in increased land values and general prosperity.

DETAILS OF AWARDS.

Competitor.	Variety.	Apparent Yield*.	Trueness to Type. (Max. 20)	Freedom from Disease. (Max. 20).	Evenness. (Max. 20).	Cleanliness†.	Condition and Appearance‡.	Total.
		bus.						
Beveridge Bros.	Yandilla King	34	16	18	20	29	26	143
G. R. Altmann	Gresley and Penny ...	33	18	18	19	28	26	142
V. Barden	Canberra	34	19	18	18	26	26	141
W. Roche	Currawa	35	19	19	19	24	24	140
P. Tyrell	College Purple Straw ...	32	17	17	19	27	27	139
W. G. Law	Canberra, Currawa and Gresley.	27	20	19	18	27	26	137
P. Tyrell	Canberra, Gresley and Florence.	30	18	17	18	27	27	137
J. B. Barling	College Purple Straw ...	33	18	19	19	23	24	136
F. Nalder	Turvey and Rymer ...	31	19	17	18	25	25	135
Richards Bros.	Florence and Gresley ...	31	18	17	17	27	25	135

* One point for each bushel of apparent yield
† Maximum for first crop, 24 points; second, 25; third, 26; fourth, 27; fifth, 28; sixth, 29; over sixth crop, 30 points.
‡ Maximum for first crop, 24 points; second, 25; third, 26; fourth, 27; over fourth crop, 28 points.

THE BOGAN GATE COMPETITION.

G. C. BARTLETT, H.D.A., Agricultural Instructor.

The past season has seen great activities in connection with crop competitions, particularly in the western districts, and this year Bogan Gate district competed with fourteen entries. The competition was conducted under the direction of the local P. A. and H. Association.

The country is flat to undulating, most of the wheat lands being more or less flat, and of drift formation. It is mostly red loams to clay loams, but in some parts runs into black soil of a clayey nature and in others of a sandy formation with touches of quartz gravel. The predominating timber is pine and box. Having an average rainfall of 18½ inches, and most of the soil being typical wheat land, the country produces splendid crops. The past season was rather dry in the autumn and very wet in the spring. The sowing season was somewhat dry, and the deeper sown crops, especially those sown with hoe drills, came up better. This was particularly noticed where one crop at Gunningbland was sown with three drills behind a tractor, the centre drill being a disc.

The rainfall on the fallow was 9·71 inches and on the crop 14·36 inches, made up as follows :—

On Fallow.	inches.	On Crop.	inches
1923—August	·27	1924—May	·64
September	1·21	June	2·06
October	1·65	July	1·73
November	·78	August	1·88
December	1·33	September	3·34
1924—January	·79	October	1·38
February	2·03	November	3·33
March	Nil		
April	1·65		

All the crops except one were manured with amounts varying from 35 lb. to 60 lb. superphosphate per acre, the majority favouring 55 to 60 lb. The fertilised areas showed up considerably better than the unmanured portions.

All the areas except one were fallowed and the crop unfallowed was on new ground. Where the fallow had been fed off and well worked, it showed to corresponding advantage in the cleanliness of the crop. Wild oats were prevalent this year, and there was a fair sprinkling of iron weed and thistles. Cockspur or Saucy Jack seems to be spreading this year. Some of the areas were mouldboard and some disc ploughed. No definite conclusion can be arrived at as to the value of the implements from the yields.

A large majority of farmers used graded seed, and the resultant crops showed to decided advantage over the crops sown with ungraded seed. Rates of seeding mostly ranged from 50 to 60 lb. per acre, with one at 42 lb. and one at 38 lb. In every case except one the seed was treated, and in the exception the crop was badly infested with bunt or ball smut. The large majority favoured the dry copper carbonate method with better results than the bluestone treatment. Very little bunt was present in the crops treated with the former method.

There were odd heads of loose or flying smut throughout the crops, but not enough to cause any appreciable loss. There was also a little smut generally, but only in one crop of the fourteen inspected did a bad attack occur. Foot-rot occurred here and there, but not to a sufficient extent in any particular locality to cause a loss of even one bushel to the acre.

Take-all was also present in most crops, but only in one instance did it cause a serious loss, and that was in a low-lying, boggy paddock of a black soil nature with a watercourse through it.

When these crops were judged it was rather late in the season to notice any mildew, but this fungus was not reported by the farmers here. Black rust was practically absent, though a little of the yellow flag rust was noticed in odd parts. This latter type of rust is comparatively harmless, and did no damage this season.

About the beginning of October, some startling reports were heard about serious damage being done and heavy losses being expected from the attack of fungus in the Bogan Gate district. At the time of judging this had not turned out nearly so bad as early reports seemed to indicate, and, in fact, the crops on the whole looked very well.

Early in the summer a fungous disease made itself apparent on the flag. This was identified as *Septoria tritici*, or wheat leaf blight. It has often been present before on the lower leaves of the plant, and has caused the premature dying of the first couple of flags, but warm weather following usually checks it. This season, owing to an abnormally cool and wet September, this fungus spread to the rest of the flag more or less extensively, especially round this district. It was first noticed by the farmers to be doing what appeared to be serious damage early in October, and was the cause of the ensuing alarm. However, warm weather in October checked the fungus, and being followed by a fortunate and beneficial fall of 60 points and other falls during October, the situation was saved considerably. The plant received a check through being robbed of a lot of its food supply, causing the leaves to die before their proper function was performed, resulting in a premature ripening condition of the plant indicated later by an unhealthy whiteness of the straw (instead of that slow-ripening honey colour) and a brittleness of the straw just below the head. In consequence of this a lot of pinched grain was expected, together with a certain loss of yield. Happily, however, this was not nearly so bad as was expected, and there is no doubt the rains in October, following a warm spell, did a lot to revive the crop and help it fill its grain. The crops on the whole filled out remarkably well considering the extent of the attack on the flag. The yields on the average good country and on well farmed areas were estimated to average 25 to 30 bushels and over. The quality on the whole, although more or less slightly pinched, should be up to f.a.q. standard. A few exceptions were badly pinched, and some crops filled quite plump, round grain.

The colour throughout was good. Of the fourteen crops inspected, six gave an estimated yield of 30 bushels and over, two were estimated at 28 bushels, two at 27 bushels, while from the other four crops yields of 24, 22, and two of 18 bushels were expected. These latter low yields were not altogether caused by disease. Reports were heard in November of serious damage and loss occasioned by storm. In view of the severity of the storms (three in number) that passed over the district in this month, together with the susceptibility of certain varieties, very little actual damage was done.

One or two crops on the black soil suffered rather severely. One or two went down in circular patches and one or two were more or less laid right over the one way, but on the whole the majority stood up rather well and there was not much anywhere that modern machinery, especially with the false comb attachment, could not garner.

In some parts Gresley went down, but this year it grew very tall and heavy-headed. The dense stooling of this variety was remarkable.

Canberra was largely grown, and also went down in parts where it had grown rather tall; indeed, this is a natural weakness of the variety, though some crops stood up very well. It has yielded very well this season in some instances, filling up its grain three across—better on the average than other varieties similarly attacked by the *Septoria* fungus.

Federation also grew very dense crops, and yields of 32 bushels were estimated from this variety on the better-class soils. It was free from any serious damage from rust.

Bald Knob is a new variety tried out in larger areas this year. In one case it produced a crop estimated at 30 bushels yield from a 38 lb. seeding. Some dense crops of this variety were seen, but it grew rather tall, and being not particularly strong in the straw, lodged rather badly in some cases as a result of the severe storms in November.

Florence produced what must have been some very nice looking crops earlier in the season, but the grain of this variety appeared to be more affected by *Septoria* fungus, and in some cases the crop lodged in a circular manner throughout.

Taken on the whole, the crops, except in two cases, would have been very free from any serious damage by disease had it not been for a bad attack of *Septoria* in September, and the harvest from Bogan Gate would have been phenomenal. There were three first crops and one second crop. These were handicapped by the maximum number of points allowable under two of the sections of the schedule. Had these crops been on older paddocks and possessed the same appearance they would have shown well up in the total points. Type and purity and evenness and cleanliness were particularly good in the winning crop, and it was on rather an old paddock. The owner had been farming there for twenty-seven years. This reflects great credit on the competitor. The crop placed second was estimated to give the heaviest yield of those inspected, its chief weakness being the presence of disease. The plot that came sixth was a very creditable crop, being also particularly good as regards type and purity and evenness. Cleanliness here was not quite so apparent as in the winning crop.

Details of Awards.

Competitor.	Variety.	Apparent Yield.*	Trueness to Type and Purity (Max. 20).	Freedom from Disease. (Max. 20).	Evenness. (Max. 20).	Cleanliness.†	Condition and Appearance.‡	Total.
Dwyer Bros., "Alverna," Bogan Gate ...	Canberra	30	18	16	18	27	25	134
H. K. Nock, Nelungaloo	"	33	16	14	18	26	21	131
W. J. Dwyer, "Daisy Park," Bogan Gate...	Federation	32	16	16	17	24	24	129
A. Mills, "Durran," Gunningbland ...	Canberra	28	18	16	16	24	25	127
P. F. D'Arcy, "Innes Vale," Bogan Gate...	Bald Knob	30	18	15	17	25	20	126
Ferguson and Walker, "Myall Park," Bogan Gate.	Bald Knob, and Florence (first crop).	30	18	16	18	21	20	123
J. F. Abeckett, jnr., "Sharpe's Additional" Bogan Gate.	Canberra	27	18	16	16	26	18	121

*One point for each bushel of apparent yield.
†First crop, 24 points; second, 25; third, 26; fourth, 27, fifth, 28; sixth, 29; over six crops 30 points.
‡First crop 24 points; second, 25; third, 26; fourth 27; over four crops, 28 points.

How to Form a Co-operative Society in New South Wales.

H. A. SMITH, F.S.S., Registrar of Co-operative Societies.

THIS article has been written with the view of arousing the interest of the "man on the land," but the general remarks on the formation of societies will apply to any kind of society contemplated by the Act.

It is well to expend careful thought at the outset in initiating co-operative enterprises. Forethought will probably prevent many difficulties from arising, and will usually provide a means of overcoming those which do arise.

The matters* to be considered by promoters of co-operative societies are, mainly, two, viz.:—(*a*) The need and scope existing for the proposed society. (*b*) The steps to be taken in forming it.

First Considerations.

The first and vital consideration is the purpose the society is to serve. If it is not to fulfil some necessary economic function for its members, it is improbable that it will attract much support and, even if it becomes established, its collapse will probably be only a matter of time.

In considering what functions the society should undertake, there is very little local experience to render guidance. Hitherto co-operative principles have been most successfully applied to the buying and selling of merchandise, but, latterly, considerable success has been obtained abroad in marketing farm products co-operatively. In several countries co-operative credit societies have been developed, and it is believed generally that there is considerable scope for their operations in New South Wales.

If the proposed society is to undertake the work of supplying members with household and farm requisites, it would probably obtain much useful information and advice from the Co-operative Wholesale Society at Newcastle. But if it intends to market the products of members it will be entering a new field in New South Wales, and will find it necessary to do some pioneering work. In this case a study of the experience of similar co-operative societies in other countries would probably be helpful. Fortunately there is a considerable number of readable books, by practical men, giving accounts of the systems followed abroad, and from these much valuable information may be obtained. One of a number of useful works is "Co-operation in Agriculture," by Powell.

In accordance with the Act a society may be registered only as one of the kinds for which a set of objects and powers is set out clearly in sections 7 to 33 of the Act. The type with the widest scope is the Trading Society which, however, is debarred from marketing primary products for its members,

* See also *Agricultural Gazette*, September, 1924, p. 633.

so that it will probably be found that the Rural Society which has power to market products, to retail supplies and to render other services to its members will best suit the needs of farmers.

The scheme of the Act and its main provisions are explained in narrative form in a pamphlet entitled "Notes on the Co-operation, Community Settlement, and Credit Act, 1923," copies of which will be supplied free of charge to applicants. This explains in detail the functions of each kind of society, together with other relevant matters such as the provisions relating to finance and general principles, and reference should be made to it before deciding upon a type.

It may be found that the range of functions allowed to the general type of society chosen is greater than is needed by the particular society contemplated. This, however, should cause no embarrassment, because the society need embody in its rules only those objects and powers which it intends to use in practice.

One other matter to be settled at the outset, at least tentatively, is the district to be served. This will be determined mainly by convenience, and usually choice should fall on a compact locality around a recognised centre, where there exists a definite community spirit, and where there can be obtained sufficient members with common interests to make the society a success. It is also desirable that members should be acquainted with each other, and it is necessary that they should be prepared to trust one another.

Finance.

A last, but most important matter to be considered among preliminaries, is the question of finance.

The cost of forming and registering the society need be very small, because no fee is charged for registration, stamp duty is not imposed on any document issued in connection with its capital by the society and the model rules provided simplify legal formalities. However, unless operations are commenced in a humble way, the expenses of establishing the business may be considerable. The Act provides that these may be met either out of capital or income.

The society will have to depend of course on the contributions of members for some of its working capital, but most societies may receive deposits, and probably they will be able to obtain a loan for such purposes as building, either from the Rural Bank or from an ordinary trading bank, or, perhaps, by issuing bonds. In this connection it is well to remember that, while the special function of the Rural Bank is to assist primary producers, advances are made as business propositions. The Bank will naturally consider applications for loans on their merits; consequently the better the security offered the easier it will be for the society to obtain a loan.

Probably the only considerable security the society will have to offer at the outset will be its uncalled capital, together with a mortgage over any assets it may acquire in expending the loan. For various good reasons these

are not always considered adequate, and additional safeguards will probably be required by the lender. These can be provided in several ways, viz. :—

(1) a promissory note or guarantee from each member for the repayment of a certain amount of the loan, if the society fails to meet its obligations;

(2) a joint and several guarantee of repayment from each of the directors or other prominent members of the society; or

(3) the issue of shares with a contingent liability.

The two methods first mentioned, though successfully applied in numerous cases, sometimes meet with objections from members who are averse to signing promissory notes. But such objections are not altogether reasonable, because they imply that the lender should show more faith in the success of the society than the member who is part of it, and who joins it in order to share in its benefits. An alternative scheme is for the members themselves to lend to the society the funds it requires, but where they have need of the direct personal use of all the capital they possess, this obviously is not as advantageous an arrangement for them as providing guarantees for the repayment of the society's loan.

The third method may be found very convenient in some cases. This consists in attaching to all shares issued a contingent liability to pay an additional amount to the society if needed to meet its liabilities in the event of winding-up. Such contingent liability, however, may not exceed one-half of the nominal value of the shares. The advantage of issuing shares with a contingent liability is that it gives the society a wider margin within which to arrange a loan without members being asked for promissory notes.

In any case, it is desirable that the society should arrange to extinguish the loan by annual repayments.

There are no statutory limitations upon the society's power to borrow during the first sixteen months' operations if it has not received deposits, and thereafter a society may borrow to any extent, otherwise than by the issue of bonds, unless it has issued bonds or received deposits which have not been repaid.

The above remarks apply mainly to the raising of loans for use as working capital in the society. Where funds are needed to finance marketing or kindred operations of a seasonal character, accommodation could probably be obtained by way of bank overdraft under proper safeguards.

Propaganda.

When the scheme of the society is sufficiently matured, steps should be taken to ascertain the amount of support the project is likely to receive from prospective members. Inquiries could probably be made most conveniently through an informal committee constituting the nucleus of the society.

It may be found that, to the average person, co-operation is little more than a name, and that few really understand that there is a vital difference between a co-operative society and a company or other form of business

organisation. The point to emphasise is that the co-operative society is called into being solely to render certain services and to provide certain benefits *for its members,* who are therefore both its customers and its owners. Consequently the society does not aim to make profits nor to pay dividends on share capital in the ordinary way. The members form a corporate body which deals with individual members in order to effect economies for them. In other words, the members of the society undertake to carry on business for themselves through the society instead of handing it to someone else to do for them—for a consideration.

The distinction may be illustrated thus :—

A person investing £100 in a public company may receive at the end of the year a net dividend of £8 if operations have been successful, and apart from a possible appreciation in the value of his shares, obtains no further advantage.

A similar amount subscribed to a co-operative society might earn up to £8 dividend. The member would be entitled to trade through the society, and he would perhaps receive a rebate of 2s. in the £ (an amount common among co-operative trading societies) on the purchase of goods, for which he would have paid not less in other shops during the year. However, in practice he would probably not be required to contribute to the society anything like £100 in capital. But a co-operative society cannot rightly be viewed as an ordinary investment because, as has already been stated, it is a medium for effecting economies and rendering special services to members.

When the idea of co-operation is fully grasped, it will be realised that the contribution of share-capital to the society will not of itself ensure success. Unless members are prepared to use the society actively as their medium of business, its capital is of little value, and operations can hardly be successful. Generally speaking, satisfactory results are obtained by a society when it transacts a considerable proportion of the business of its members. In this respect it is totally different from an ordinary company which wins success through undertaking any remunerative business.

Plan of Operations.

It is advisable for the society, on commencing, to have an assured volume of business to do. This can be best secured by obtaining a guarantee from each member of the use he will make of the society. In this connection it is important to note that section 77 of the Act specially validates contracts between a co-operative society and its members requiring them to have certain dealings with it for a fixed period. In other spheres such contracts might be invalid as being in restraint of trade. Some marketing societies in America require their members to contract to dispose of all their produce through the society for a period of five years. This is most necessary because, without some binding form of guarantee, a marketing society is in grave danger of succumbing to the competition it is likely to meet when it commences operations.

The usual lines upon which marketing societies are constructed in America are as follow :—

(1) The society handles a single commodity, such as wheat, butter, eggs, oranges, &c.
(2) Only growers or producers are admitted as members.
(3) Members deliver the whole of the particular product to the society for a term of years.
(4) An internal pooling arrangement is made so that every member gets the same price for the same quality and grade of product, regardless of the time of delivery or sale.

Such societies have been very successful in America, and a number have come into existence in New South Wales.

In addition some organisations have been formed already in this State for providing services on co-operative lines. There are a considerable number of instances of sheep dips being carried on in this way, and at least one for the purchase and use of a potato-digging machine.

In view of these considerations a certain amount of tactful educative propaganda should be undertaken in order to ensure that the idea of the scheme is thoroughly understood.

Perhaps a personal canvass is the most effective way of approaching prospective members, although the distribution of circulars might lessen the labour involved. In any case every likely member should be approached in order to interest as many persons as possible. This will also help to dispel suspicion of ulterior motives. The canvasser should be enthusiastic, and well informed as to "co-operative principles" so that he will not be rebuffed too easily if he meets opposition to his proposals or arguments.

During the canvass an estimate should be formed of the amount of support that can be depended upon both as regards contributions of share-capital and guarantees of business to be done with the society.

When it appears fairly certain that the society will be formed, application should be made to the Registrar of Co-operative Societies, Sydney, for copies of the model rules of the kind of society contemplated, and for all forms needed when applying for registration. These are supplied free. Copies of the Act and Regulations may be obtained from the Government Printer, price 2s. 10d. and 1s. 1d. respectively, including postage.

Public Meeting.

When inquiries have been completed and interest thoroughly aroused, a public meeting should be called to consider the formation of the society. This meeting should be advertised widely, and due formality should be observed in order to encourage public confidence in the project. If possible the attendance of an expert from a successful society of the kind contemplated, or from any association with which the society proposes to affiliate, should be secured. In addition, the services may be obtained of a special officer

attached to my staff to assist in the formation of the society by delivering explanatory addresses, and affording other instruction or advice. This officer, however, will not be available for carrying out the detailed work of organisation because experience shows that societies so fostered are seldom long lived.

The Act requires that the inaugural meeting of the society must be attended by seven or more adult persons qualified to be members of the proposed society, and that there must be presented to the meeting :—

(*a*) A written statement of the objects of the society, and the reason for believing that, when registered, it will be able to carry out its objects successfully ;

(*b*) A copy of the rules which it is proposed to tender for registration.

The written statement should be in the nature of a prospectus.

Discussion might be initiated by submitting a motion that a co-operative society be formed. If it is thought desirable, after considering the written statement, the meeting might appoint a committee to consider the rules, and adjourn to a later date in order to receive its report.

The adjourned or subsequent meeting should be held within a short time in order that interest may not lapse. The task of the committee need not be arduous, because the model rules already mentioned can be used. These provide for the full range of objects and powers allowed, and set out provisions to govern the routine of the society. It is necessary only to determine certain matters, such as the class of persons to be admitted as members, the minimum share-holding per member, the principle upon which shares shall be taken up, the voting powers of members, and so on. It will be found that the model rules provide a complete frame, or code of directions, for the working of the society, and they will serve as a basis for discussion if alteration be desired. They are not mandatory, but may be varied to suit the needs of the society, consistently, of course, with the Act. It is necessary that the minimum share holding be made sufficiently high to ensure that adequate funds will be obtained to finance the society.

After the rules and the written statement or prospectus have been approved and seven or more adult persons, qualified to be members, have signed an application for membership they may proceed to elect the first directors and other officers in accordance with the proposed rules. It is essential that the directors chosen should be enthusiastic supporters of the project and that the secretary should be zealous and thoroughly trustworthy.

Application for Registration.

As soon as possible after the inaugural meeting the secretary should make application for registration of the society, because no money may be received in consideration of the allotment of shares until registration is obtained.

The procedure to be adopted in obtaining registration is simple.

A printed form of application (No. 1) is supplied by the Registrar showing all the information needed. This form must be signed by seven members of the proposed society and returned to the Registrar accompanied by—

(*i*) Form 2, being a statutory declaration by the chairman and secretary of the inaugural meeting that section 39 of the Act has been complied with;

(*ii*) A copy of the statement or prospectus submitted to the meeting;

(*iii*) Two copies of the proposed rules of the society signed by at least seven applicants for membership, each signature having been witnessed;

(*iv*) Form 3, duly completed, showing which of the proposed rules cover matters required by the Act;

(*v*) A list showing the name, address, and occupation of each of the directors of the society (form 4);

(*vi*) A card for each member, showing his name, address, occupation, and the number of shares applied for (form 5). Blank cards for this purpose are supplied by the Registrar.

Commencing Operations.

The society, after registration, is duly incorporated, and may proceed with its business. A meeting of directors should be called for an early date to consider the commencement of operations. It will be necessary to consider the question of finance, to arrange at once for the collection of deposits on shares and for the choice and appointment of a manager, to complete arrangements for an office or other place of business, and to arrange for all other matters incidental to the opening of the business.

Certain questions of policy will also arise for settlement, if they have not already been dealt with, such as the mode of dealing with non-members, whether credit will be granted, and, if so, upon what terms.

Choice of Manager.

Perhaps the most important matter is the choice of a competent manager, because on him depends to a large degree the ultimate success or failure of the society. My experience of co-operative societies in New South Wales has confirmed this. Powell, a recognised authority, treats it as a matter of supreme importance. He says:

> "No co-operative organisation can succeed if the directors are unwilling to place its business management in the hands of a strong, aggressive, thoroughly experienced, well-paid man, and to carry out its policies through him alone . . . . Of all the different factors that have been contributory no single factor, unless it is disloyalty of members themselves or the meddling of members in the duties of management, has operated so strongly against the success of farmers' business associations as the low-paid, inexperienced, incompetent managers selected by the directors to handle these organisations. The position is not a

place to be filled by a popular local leader, who has often failed in business or who has been moderately successful. There are many managers of this type. They are 'good fellows,' but they often stand in the way of real progress in the co-operative movement."

This may be an over-statement of the case, but it draws attention to some very important considerations. Certainly it will be a very great advantage if the man selected as manager has had a sound business training, and either has or is prepared to acquire a knowledge of co-operative trading. He should also have a good practical knowledge of book-keeping.

A man with the necessary qualities will not be obtained cheaply, for he can usually command a remunerative salary in the ordinary commercial world. An inferior manager is not likely to be able to protect the society when its interests conflict with those of other concerns managed by more highly skilled business men.

It is possible that where a society commences the business of marketing products for its members, and these products come forward only during a relatively short period of the year, there will not be sufficient work to warrant the payment of a full year's salary to the manager. In such cases it will probably be possible to find some competent person with other employment in the country willing, for a sufficient remuneration, to undertake the duties. But in these circumstances the stake of the manager in the society will be lessened, and considerable care should be exercised in seeing that the individual chosen is thoroughly competent and trustworthy, and really has time to devote to the duties which he undertakes.

If circumstances are favourable and the society includes among its operations the purchase and supply of household and other requisites to members, sufficient employment could probably be found for a full-time manager. Experience has shown that societies may be formed successfully on this basis.

In conclusion it may be said that the essentials of success are the adoption of sound business methods, the loyalty of members and the appointment of a competent manager. If a true co-operative spirit is developed, success is practically assured.

So much depends upon the adoption of sound business methods, that the Act makes it compulsory for the society to adopt certain elementary safeguards. It must keep certain books and accounts in a form prescribed by regulation, and have them audited at least once a year by a competent person approved by the Registrar. In addition every officer having the custody of money for the society is required to provide a fidelity guarantee.

*   *   *   *   *

It will be observed that, while the State provides that the societies must be duly constituted and must adopt certain ordinary business methods, it does not afford monetary assistance to them nor does it attempt to stimulate their growth unduly. The co-operative movement is left free to work out its own destiny.

The Registrar is given power to inspect societies with a view to checking irregular practices in order to protect the members and the good name of the co-operative movement. He is also prepared to supply information and a certain amount of guidance if it is sought. But the Registrar does not undertake, nor interfere in any way with, the duties of management.

It has been found generally in other countries that excessive paternalism is inimical to the best interests of the co-operative movement, and that co-operation is most successful where it develops through its own efforts. The State can best assist by providing facilities for the proper functioning of societies.

Although individual societies can obtain, and are obtaining very satisfactory results, the best will not be achieved from co-operative enterprise until a considerable number of societies are in existence and their operations are co-related through the formation of associations and unions. These will gain for co-operative interests a powerful voice in determining their economic environment. Those engaged in the creation and management of co-operative societies should, therefore, remember that, as their members are the foundations on which the society is based, so the society is the base on which a complete and efficient co-operative super-structure must rest.

A British Agricultural Tribunal of Investigation reported in May, 1924, that "everywhere co-operation, in one form or another, has been recognised as a better way of economic organisation." It commends the formula of Sir Horace Plunkett—"better farming, better business, better living," pointing out that "better business" is the central necessity, because by that means alone can the farmer "secure himself against being exploited by other more highly organised interests. . . If there is not a system which enables the farmer to purchase economically and to manufacture, grade and dispose of his produce to the consumer with as few intermediate charges as possible, the industry lacks an essential condition of security. . . Better living requires the basis of economic security, and by better living is meant better community organisation in education, in public health, in recreation, and in other ways which affect the attractiveness and contentment of country life. . . The organisation of the farming community on co-operative principles makes it far more possible for the voice of the primary producers to be heard and for their interests to be directly represented."

Feed in Relation to Butter-fat Tests.

Many farmers have endeavoured, without or with little success, to raise the test by the use of certain kinds of feed, writes W. N. Paton, in the *New Zealand Journal of Agriculture*. It can be safely stated that there is no feed which will of itself appreciably raise the test. By the use of certain feeds it is possible to raise the test by small amounts, but such increases are usually only temporary. Provided a cow is well fed and receives a good variety of palatable food which supplies the essentials, she will return as much butter-fat by this means as by any other, and with less trouble to the feeder.

"Elements of Land Economics."

In contrast to the fields of money and banking, of labour and industry, of business organisation, and of many other spheres of economics, the subject of land economics has been surprisingly neglected. With many of the problems commonly called "land questions"—tenancy, agricultural credit, forestry, and so forth—most are familiar, but, according to Dr. Richard T. Ely and Mr. E. W. Moorhouse, both associated with Wisconsin University, the economic problems that lie at the very base of all these others have so far escaped consideration. To such an extent is this true, they suggest, that the solutions that have been hitherto offered for the more superficial "questions" have rather approximated to quackery.

As an effort to state the basic problems, therefore, to consider the general characteristics which distinguish property in land from other forms of property, and to classify land according to the requirements of human endeavour, this book—the first of a series of which Dr. Ely is himself the author—is distinctly interesting. In these 330 pages land is dealt with as an economic factor, general principles being presented for the treatment of land as a commodity, and farmers and others who have given attention to the more abstract problems connected with land will find it useful as approaching a complex subject from a somewhat new point of view.

The publication of the book is in part the result of the activities of the Institute for Research in Land Economics and Public Utilities, of which Dr. Ely is the Director.

Our copy from the publishers, Macmillan & Company, Ltd., London.

"Soils and Crops."

This is a companion book to "Live Stock and Farm Mechanics," a work by the same author that already has a wide acceptance on its subject. In both the author, Mr. John H. Gehrs, of the South-east Missouri State Teachers' College, has in view the presentation of the material in agriculture that is essential in elementary schools, but he also keeps before him the large number of young people interested in agriculture who will never go to college or even to high school.

The book first devotes over 100 pages to soils, stating simply the processes by which soils are formed, their physicial and biological features, and the maintenance of fertility. The second part involves some 250 pages in which individual crops are dealt with, and the third part—covering over fifty pages—contains fruit and vegetable matter, and a few of the most serious insect pests of crops. The book is a most comprehensive one.

Our copy from the publishers, Macmillan & Company, Ltd., London.

Agriculture and the Laboratory.

The agriculture of whole sections of our country, upon which the livelihood of many thousands of people depends, may be entirely changed by experiments in an attic laboratory, or by the work of a single man in his own back garden. The miles and miles of Marquis wheat-fields that one travels through when going west on the Canadian Pacific all owe their existence to a single head of cold and drought resisting wheat that Dr. Saunders, of Ottawa, discovered after years of patient, persistent work among hundreds of hybrids which he had made.—Marian H. Bell Fairchild, in the *Journal of Heredity.*

Pasture Improvement.

WORK IN NORTHERN TABLELAND DISTRICTS.

J. N. WHITTET, H.D.A., Agrostologist.

THE main centres in the Northern Tablelands where activity in improvement of pastures is most marked are Tenterfield, Glen Innes, Stonehenge, Guyra, Ben Lomond and Kentucky. In these elevated districts, as in other parts of the State, the need is felt for winter grasses, and in few localities of New South Wales do winter grasses respond better to climatic conditions than here.

The main native grasses, which are plentiful and generally bulky at the beginning of the winter, are Red Leg (*Amphilophis decipiens*), one of the Blue grasses (*Andropogon affinis*), Kangaroo (*Themeda Forskalii*), and Tussocky Poa (*Poa cæspitosa*). These all dry off very rapidly and become somewhat hard and innutritious, and large stock grazing on them lose condition very rapidly and frequently suffer from impaction. During the winter of the present year some paddocks had a covering of these grasses and feed was knee deep, but the animals were still low in condition.

A striking contrast was presented in areas where introduced winter grasses were available, stock being in excellent condition despite the fact that the carrying capacity of these grasses was taxed to a greater extent by 50 per cent. than was the case with the native grass pastures. In some unimproved pasture paddocks a little green feed is found on Wallaby grass (*Danthonia semiannularis*), Prairie (*Bromus unioloides*), Barley grass (*Hordeum murinum*), and Kentucky Blue (*Poa pratensis*).

Grasses and Clovers Mainly Used.

Cocksfoot (*Dactylis glomerata*) and Perennial Rye (*Lolium perenne*), in addition to Perennial Red clover (*Trifolium pratense* var. *perenne*), have been the main pasture plants sown during past years. Toowoomba Canary (*Phalaris bulbosa*), Tall Oat (*Avena elatior*), Tall Fescue (*Festuca elatior*), Giant Fescue (*Festuca arundinacea*), Cow Grass clover (*Trifolium pratense* var. *perenne*), and Sheep's Burnet (*Poterium sanguisorba*), in addition to those already mentioned, are also being largely used in mixtures sown by farmers and pastoralists.

Toowoomba Canary is the best all-round plant for these localities. Not only is it the most frost-resistant and bulkiest winter grass, but it provides good feed during summer months. Colonel H F. White, of "Bald Blair," Guyra, has, during the past twelve years, gradually extended his areas of this grass, and over 800 acres are now established on the property. After trying many species, he considers that *Phalaris bulbosa* is easily the best.

Sunnyside.

In the Tenterfield district Tall Fescue, Cocksfoot, Perennial Rye and Perennial Red clover are providing succulent winter feed, and giving much better results than the unimproved pastures. These plots were planted on pasture land typical of the district. Sheep are showing preference for the plants in the following order:—Perennial Red clover, Perennial Rye, Cocksfoot and Tall Fescue.

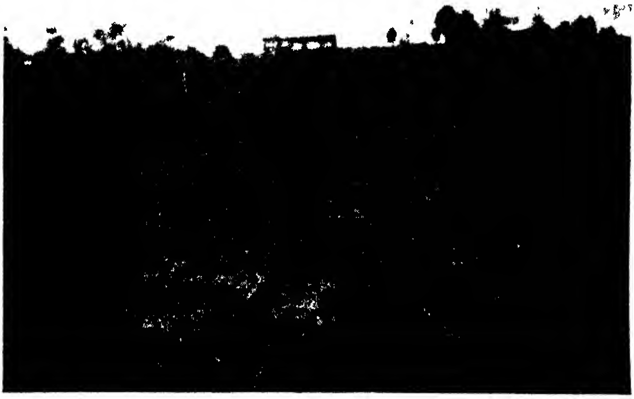
Glen Innes.

The winter grasses at Glen Innes Experiment Farm may be classified in order of merit as follows:—Toowoomba Canary, Tall Oat, Hooker's Fescue (*Schedonorus Hookerianus*), Tall Fescue, Giant Fescue, Cocksfoot, Perennial Rye, and Awnless Brome (*Bromus inermis*).

Fig 1.—*Phalaris bulbosa* paddock in the pasture experiment at Glen Innes Experiment Farm.

Toowoomba Canary, in continuous grazing trials during the past four years, has carried at the rate of two and a quarter sheep per acre, and the animals have put on more weight than those feeding on Cocksfoot, Perennial Rye, and Perennial Red clover stocked at the same rate, or those on native pastures carrying one sheep per acre; in the last mentioned case the animals have access to large quantities of fodder crop residues and stubble areas.

A special feature of Toowoomba Canary grass is its ability to withstand very close grazing and to respond more rapidly to falls of rain than any other winter grass. This is by virtue of its thickened, bulbous, spreading crowns. Tussock formers, like Cocksfoot and Rye grass, are eaten out more readily than the above grass, especially during dry periods.



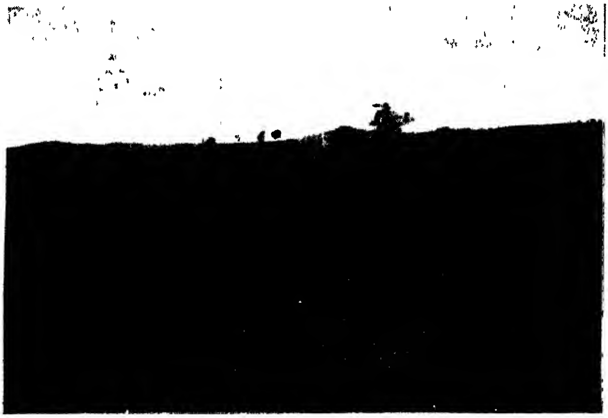
Cocksfoot Pasture. showing many bare patches.

Phalaris bulbosa **Pasture.**

Note how evenly the ground is covered.

Stud Aberdeen Angus Cattle on *Phalaris bulbosa* **at Guyra.**

Pasture Improvement on the Northern Tableland.



A *Phalaris bulbosa* Pasture at Guyra.

The effects of a nurse crop are seen in the patchy covering on the right-hand side. No nurse crop was sown with the seed for the left-hand portion.

A Useful Comparison.

Coarse, dry tussocks of Kangaroo and Tussocky Poa Grass in the fore ground.

Perennial Rye, Cocksfoot, and Cow-grass Clover making succulent growth on the left-hand and in the distance

An Improved Pasture a Kentucky.

Introduced grasses and clover.

Pasture Improvement on the Northern Tableland.

The sheep in eating round the tussocks work the soil away from the surface roots and considerably impair the strength of the plants, many of which become tramped out in time. This is very noticeable in the case of the Rye grasses and Cocksfoot, although the latter is somewhat hardier and deeper rooted.

Perennial Red clover is a most useful legume to include in a grass mixture for this district. It stands stocking exceptionally well, and in a good season seeds profusely. On the poorer class of clay flats Tall, Giant, and Hooker's Fescues have given good results, being very hardy grasses which thrive well on shallow, damp land, and have proved superior to Cocksfoot, Tall Oat, Timothy (*Phleum pratense*) and Kentucky Blue. An area of Tall Fescue, planted in 1918 on this class of country, at Mr. J. H. Martin's, "Ardlair," Glen Innes, provided the only hay harvested during the spring of 1922 and summer of 1923, the wheat and maize crops failing owing to dry conditions. Sheep's Burnet (*Poterium sanguisorba*), being hardier, stands better under these conditions than any of the clovers.

Stonehenge.

At Stonehenge station some areas of *Phalaris bulbosa* have been established over ten years, and they have demonstrated that it is the best grass for this district. Seed has been collected from the original areas for sowing additional paddocks, and now over 100 acres of this grass are being grazed.

When grazed continuously with sheep, the life of the grass is estimated at about ten years, but if the paddocks are allowed to seed occasionally, the areas become thickened up and a good stand is established again. By this method of renovation the paddocks will return very profitable results for an indefinite period.

The grass should be well established before being heavily grazed. This period would be about eighteen months from time of planting (early autumn planting is recommended), although *Phalaris bulbosa* will improve if lightly stocked at intervals during this period, as that tends to induce the plant to spread laterally. After feeding an area continuously for two or three years, it is advisable to spell the paddocks for at least two or three months. This is best carried out from November to January, thus enabling the grass to seed. Allow some seed to fall, and collect the remainder for sowing additional areas.

In this district the growth and permanence of the grass on red soil areas are not so satisfactory as on the black soils. The red land produces a somewhat spindly growth, and the grass does not form seed freely. The black soil is invariably moister and richer than the red, and some areas sown on the former have been grazed continuously for seven to eight years. In August just past it was estimated by the overseer of this property that a 15-acre paddock, sown three months ago, was carrying sufficient feed to carry 500 sheep for a fortnight. The feed was a trifle dry, but was over 2 feet high.

Phalaris bulbosa paddocks should never be allowed to become too rank before being fed off. If the grass is allowed to become coarse it dries out readily, and stock do not thrive as well as when they are put on succulent green growth 6 to 8 inches high.

Guyra.

Colonel H. F. White, of "Bald Blair," Guyra, has over 1,000 acres of improved pasture on his property. He is the largest grower of *Phalaris bulbosa* in Australia, having, at the present time, 800 acres of this species. The original areas of this grass sown twelve years ago were carrying in August of this year as many stock as ever they did before, thus proving that the longevity of this plant as a grass for large stock is one of its special features.

Not more than 4 lb. of *P. bulbosa* seed are sown per acre, that being sufficient to produce an excellent stand. Some of the areas were sown with a mixture of 10 lb. Perennial Rye and 1 lb. of *P. bulbosa* seed, as the latter was scarce at the time of planting. By allowing the grass on these sections to set seed during the past four years the *P. bulbosa* has been gradually thickened up, until now there is a good sward. Seed is planted in June in order to escape weeds such as Fat Hen (*Chenopodium album*) and Boggabri (*Amarantus paniculatus*).

Colonel White considers that two of the main features of improved pastures of this nature are—(1) that animals put on weight during winter months, whereas those feeding on native pastures lose condition; and (2) that the quality of flesh produced by grasses such as *Phalaris bulbosa* is greatly superior to that made by animals feeding on native pastures.

The detrimental effects of sowing a nurse crop with grasses is seen in the accompanying photograph, the area on the right being sown with a nurse crop, while that on the left was planted without; 4 lb. of *P. bulbosa* seed per acre were used on each section. Of recent years the patchy area has thickened up considerably. The grass is kept heavily stocked, and paddocks are never allowed to carry more than 3 to 4 inches of growth just prior to winter, as best results are obtained during the cold weather when the grass is carrying short, succulent feed.

Like Stonehenge, the red soil does not produce the same amount of feed as the black, nor does it hold the moisture as well.

Colonel White places Tall Fescue second to *Phalaris bulbosa*. Tall Fescue should be stocked heavily, however, in order to induce it to spread laterally, and thus prevent it from becoming tussocky. Cocksfoot yellows off in winter, and at Guyra is not as good as any of the grasses already mentioned, although somewhat more permanent than Perennial Rye. After growing potatoes for four years on the red land, Perennial Rye is sown and the area is grazed for a few years. This practice keeps down weeds, provides excellent temporary pasture, and enriches the land for subsequent potato crops with

the animals' droppings. All improved pasture is top-dressed once every five years with 2 cwt. superphosphate per acre. This improvement work with pastures is being carried out at a high altitude, viz., 4,600 feet; the highest point on New England is 5,130 feet.

It is estimated that well established areas of *P. bulbosa* or Tall Fescue will carry a grown beast (large stock) to the acre. Sheep, in feeding closer than large stock, do more injury to the plants during spells of dry weather; consequently it is very necessary as far as possible to guard against the paddocks being overstocked at such periods.

Ben Lomond.

On Ben Lomond estate there are over 1,000 acres of introduced grasses, consisting mainly of Cocksfoot, Perennial Rye, Timothy, and Tall Oat, also Cow Grass clover and Alsike clover (*T. hybridum*).

During 1924 additional areas totalling 150 acres were sown with a mixture made up as follows:—Cocksfoot, 4 lb.; Perennial Rye, 5 lb.; Tall Fescue, 2 lb.; Tall Oat, 2 lb.; Awnless Brome, 1 lb.; Cow Grass clover, 2 lb.; total, 16 lb. seed per acre.

Additional areas of *Phalaris bulbosa* have been sown for grazing purposes and seed production, 4 lb. of seed per acre being planted. An old-established area of this grass has stood heavy grazing remarkable well, and in good seasons it produces an abundance of feed, the seed stems being over 4 feet in height.

The prevailing grasses in this district are Kangaroo and Tussocky Poa, both of which become badly affected by frost and affect stock in a similar manner to that observed at Guyra. The average carrying capacity of the country is, unimproved, a grown beast (large stock) to 5 or 6 acres; improved, a beast to 2 acres.

Some 40 acres of rough, low-lying, tussock grass and tea-tree country was planted in 1922 with the introduced grasses and clovers mentioned at the beginning of this section. During the winter of the present year this area carried 110 head of yearling cattle for three months. Even at the end of that period a large amount of succulent green feed remained, whereas the native grass paddocks only produced dry, unpalatable feed.

Cocksfoot does not appear to take rust as badly here as at Guyra, and makes better growth, forming good-sized tussocks. Kentucky Blue forms a fairly dense sward of winter growth, but does not provide bulky feed. Rabbits are spreading seed of this grass in their droppings.

Kentucky.

In this district small areas have been planted on various holdings. The winter grasses giving best results are *Phalaris bulbosa*, Cocksfoot, Tall Oat, Perennial Rye, and Prairie. Perennial Red clover should be included in

pasture mixtures for the locality; on one property, in particular, animals, in feeding on material from a plot sown in 1920, have spread this species to adjoining areas.

Suitable Mixtures for the above Districts.

Several mixtures that could be sown in the above districts, in the latter part of the autumn or early winter, might be mentioned. The following will be found particularly suitable :—

(1) *Phalaris bulbosa,* 4 lb. per acre; Perennial Red clover, 2 lb. (for black soil country).

(2) If *Phalaris bulbosa* is scarce, the quantity of seed of that grass may be reduced to 2 lb. per acre, and Perennial Rye, 10 lb., with Perennial Red clover, 2 lb. added (for black soil country).

(3) Tall Fescue, 4 lb. per acre; Tall Oat, 2 lb.; Perennial Red clover, 2 lb.; Cocksfoot, 6 lb. (for red soil country).

(4) Tall Fescue, 2 lb. per acre; Wimmera Rye, 4 lb.; Cocksfoot, 4 lb.; Sheep's Burnet, 2 lb.; and Subterranean clover, 1 lb. (for poor quality land on ridges).

(5) Perennial Rye, 10 lb. per acre; Perennial Red clover, 2 lb. (for potato land to be used for pasture purposes for three or four years).

Wherever possible the seed should be sown with the wheat drill, mixing the seed with superphosphate (½ to 1 cwt. per acre). The hoes or discs of the drill should be set to run on the surface of the ground as the seed only requires to be lightly covered; run a harrow at right angles to the direction of the drilling if the seed has not been well covered by the drill.

Where it is impossible to use implements for sowing and covering, the seed should be broadcasted in and around stump holes, dug-out rabbit burrows, among fallen timber, or any other suitable cover, in which it will be held and later germinate.

The Function of Agricultural Science.

The nineteenth century took the view that agricultural science was justified only in so far as it was useful. That view we now believe to be too narrow. The practical purpose is, of course, essential; the station must help the farmer in his daily difficulties—which necessitates co-operation between the practical grower and the scientific worker. But history has shown that institutions and investigators that tie themselves down to purely practical problems do not get very far; all experience proves that the safest way of making advances, even for purely practical purposes, is to leave the investigator unfettered. Our declared aim at Rothamsted is "to discover the principles underlying the great facts of agriculture and to put the knowledge thus gained into a form in which it can be used by teachers, experts, and farmers for the upraising of country life and the improvement of the standard of farming."—Sir John Russell, Director of Rothamsted Experiment Station, in a recent address at Toronto, Canada.

Farmers' Experiment Plots.

Sorghum Trials, 1923–24.

Lower North Coast.

J. M. PITT, H.D.A., Senior Agricultural Instructor.

The cultivation of sorghum is practised rather extensively on the rivers of the Lower North Coast, chiefly throughout the late summer months. While there is a certain amount of truth in the oft-heard statement that as a fodder for dairy cows sorghum has not the same milk stimulating qualities as maize (fodder), on a well-managed dairy farm it should nevertheless have its place, if only as a "stop gap" in the late autumn months, when maize crops are no longer available, and in the winter and early spring months, when the average dairy-farmer is minus pasture and very often winter cereal crops. Sorghum plays its part in keeping "springers" in condition, helping them to jump straight into milk without first having to build up condition—an important consideration, and one too often neglected.

In a season like the present, one hears many adverse reports as to the utility of sorghum, but it is not every year that such a wealth of clover and other luxuriant pastures are available from August onwards.

Saccaline is now the variety universally sown. Its powers of retaining succulence right through the winter months and its fine softish stalks, have made it more highly thought of than the more pithy varieties, Planter's Friend and Early Amber Cane.

With the object of trying out the more recent introductions, experiment plots were arranged with Mr G. C. Lindsay, Huntingdon, Hastings River, and Mr. S. Ebbeck, Vacy, Paterson River. The spring months were unusually dry. At Huntingdon the sowing was made under conditions not altogether favourable. The seed was machine-dropped in late October. Germination as a result was patchy, and it was decided to abandon the plot as far as weights were concerned. Sufficient growth took place after the December rains, however, to show that several of the newer varieties were promising, White African in particular creating a very favourable impression. This is a tall-growing variety, very sweet and succulent, free from red rust stain and tendency to lodge. Others prominent were Saccaline, Selection No. 61, Collier and Orange. The plot was sown on rich alluvial soil.

At Vacy the plot was sown later and a more satisfactory formation resulted. The seed was machine-dropped in rows 2 feet apart, on a rich sandy, loamy soil. As at Huntingdon, White African was the outstanding variety. This

variety, Orange, Collier, Sorghum No. 61, and Saccaline were comparatively free from stain. Some of the varieties lodged. Saccaline and White African, although growing to heights of 12 feet and 11 feet 6 inches respectively, were free in this respect. The latter variety created a very favourable impression.

The yields were as follows :—

	tons.		tons.
White African...	22	Collier	18¾
Saccaline	21¾	Bolong...	18
Planter's Friend	19½	Orange...	15¾
Selection No. 61	19¼	Gooseneck	14¾

Soil Analysis and Cropping Practice.

A chemical examination of the soil reveals little evidence as to the proper fertiliser or cropping system to be followed to secure maximum production, say the soil specialists at the New York State Agricultural Experiment Station at Geneva, according to *Better Fruit*. The soil is so complex chemically, it is pointed out, that a random sample taken by an inexperienced person is practically worthless as a basis for predicting what a given soil will or will not do. Chemical analysis also shows only the total amount of plant-food present without giving an accurate estimate of the amount available to the growing crop.

For these reasons, and because experience and investigation have revealed that nothing helpful can come from such analyses, the station soil men decline to analyse samples of soils sent in by farmers and others who expect to use the chemical tests as a basis for fertiliser or cropping practice.

U.S. Makes an Agricultural Inventory.

What is expected to be the most complete and accurate census of agriculture that has ever been taken in the United States will be completed at the end of the present month. The census is being taken as for 1st January, 1925, in accordance with the provisions of a recent Act of Congress. The inventory of farm property, including livestock, will relate to 1st January, 1925, and the production of crops and livestock products will be reported for the calendar year 1924.

This census is to be the first of a series of intermediate farm censuses taken in the middle of the regular decennial census periods. The schedule is the work of a joint committee of representatives from the Department of Agriculture and the Department of Commerce, and prominent agriculturists throughout the country have been consulted with respect to the questions included. Special attention is given to the classification of farm land according to its use in 1924, to the farm debt, and to farm taxes—all questions which are felt to be of particular importance at the present time. An army of between 15,000 and 20,000 enumerators is being employed.

A Score Card for Judging Green Fodder Maize.

H. WENHOLZ, B.Sc. (Agr.), Special Agricultural Instructor.

AT many coastal agricultural shows, classes exist for stalks of green fodder maize, and differences of opinion sometimes occur as to which are the most valuable characteristics in the stalks exhibited. Some farmers, it is felt, have won prizes for green fodder maize, merely on size or height of stalk, while other judges are prone to attach too much importance to thin stalks or some other single character without weighing the whole of the considerations.

The educational significance of the score card in judging is becoming increasingly recognised, and its utilisation may be regarded as a progressive move on the part of an agricultural society. The posting of the card on each exhibit, with the points awarded by the judge, enables the grower to see where improvement can be effected.

The following score card has been prepared for judging green fodder maize, in the hope that it will be utilised by agricultural societies with this object:—

	Points.
Height and weight of stalks	30
Leafiness and production of ears	20
Condition of fodder	20
Character of stems	10
Uniformity and general appearance of exhibit	10
Freedom from insect pests and disease	10
Total	100

Height and Weight of Stalks.—The green fodder crop which is most valuable is that which produces the heaviest weight per acre, and although the nature of the stalks under this head cannot be taken altogether as a measure of the yield per acre, it may be regarded as about the best index without seeing the field, just as size and weight of cobs count for so much in an exhibit of ears. It is recognised, of course, that the heaviest yield per acre of green fodder or of grain might easily be obtained by a thickly-sown crop, but no competitor can expect to come up and win by exhibiting small stalks or small ears from such a crop in a green fodder maize, or seed-ear class. The size and weight of the stalks indicate what the land or the grower can do in the way of making a heavy yield per acre, and must be regarded as the most important, though by no means the only, characters to look for in an exhibit of green fodder maize.

Leafiness and Production of Ears.—The most valuable parts of the fodder produced are the ear and the leaf, because these parts contain the most palatable and the most digestible nutrients. The stalk, especially the lower part, contains more fibre, and is less palatable and digestible. The amount of leaves and their breadth and size, together with the size or number of

ears produced in relation to the stalk, are therefore important points in considering green fodder maize. Leafiness and production of ears are grouped together, and should be regarded as of nearly equal importance, for there is not a great difference in the feeding value of the leaves and the cobs in the green fodder stage of growth. For fodder purposes, two or more ears on the stalk are to be considered of greater value than a single large ear, provided they make up to the same weight as the single ear.

Condition of Fodder.—This is, of course, a very important consideration in determining the value of the green fodder. Maize that is too young suffers from not being able to make the bulk and the weight, and therefore it has not the feeding value which it would have if left to a later stage. On the other hand, maize that is allowed to go past the best fodder stage becomes more fibrous, and therefore has not the percentage digestibility that it would have had earlier. In other words, maize increases in total nutrients as it becomes older, but loses in percentage digestibility, and the best fodder stage is when it contains about the highest sum total of digestible nutrients. This may ordinarily be assumed to be when the cobs and leaves have attained about their full development in size and before the leaves and the husks have dried too much and before the grain on the cob has become too hard. It cannot be definitely laid down that the grain should be in the milk or dough stage, because the leaves—which, it has been pointed out, are an important part of the fodder—may have gone off, and any such loss means an appreciable loss in the total of digestible nutrients in the green fodder. It is feared that many judges determine the condition of the fodder by the condition of the grain on the cob, ignoring or not paying due regard to the fodder condition of the leaves, which are also very important.

Character of Stems.—Stalks that are too coarse are usually more pithy and less palatable to stock than finer stalks. Though when chaffed they are more thoroughly utilised they have not as good feeding value as finer or more sappy stalks. This character alone, however, should not be regarded as important as some of the previously mentioned characters of fodder maize.

Uniformity and General Appearance of Exhibit.—In most cases ten or a dozen stalks are required to be exhibited in these classes for fodder maize at agricultural shows, and the uniformity and general appearance of the exhibit should be considered. For instance, some farmers cut some exceptionally big stalks, but can only get a few of them, and make up the rest of the exhibit with average stalks. This practice should be scored against by the judge, and the allocation for some points for uniformity allows him to do this. It is a better criterion of a good crop, too, and a better assurance that the seed from that crop will reproduce its characters, if there is uniformity also in such characters as leafiness, size, and number of ears, height and set of ears, etc.

Freedom from Insect Pests and Disease.—Exhibitors are generally likely to watch that no stalks badly infested with maize ear worm, northern peach moth, etc., are included in the exhibit, but one frequently sees stalks affected with

leaf rust or blight and with the dry rot disease which appears in discoloured patches on the leaf sheaths which surround the stems. Smut, of course, is to be heavily scored against.

It is hoped that these notes will be of assistance to judges, and enable farmers to improve their exhibits of green fodder maize. It is hoped also that they may tend to popularise the score card system of judging as distinct from the haphazard style sometimes adopted.

"Introduction to Agricultural Economics."

Agricultural economics "may be defined as the science in which the principles and methods of economics are applied to the special conditions of agricultural industry." Part of the meaning of economics is contained in the word "economise"—a word that most of us quite understand—but it also covers a much wider field of philosophical research, so that ultimately we learn that to be really economical is to attain the greatest possible result in proportion to cost.

As the problems of agricultural economics begin with the individual farm, this useful work—intended for the farmer and for the student—begins with a consideration of the different systems of farming, and proceeds to discuss farm business and organisation, farm accounts and the calculation of costs of production, the selection of a farm enterprise, the application of machinery and power, the problems of land tenure and of land policies, and the marketing of the produce, touching, *inter alia*, capital, credit, labour, and co-operation.

The scope of the book is thus a wide one, and the effort of the author, Dr. Lewic C. Gray (Economist in Charge of Land Economics in the United States Department of Agriculture) to maintain simplicity of treatment and style, together with a useful mechanical arrangement of the text, has been attended with a good de of success. That the illustrations should be drawn from American practice was inevitable, no doubt, but rather limits the usefulness of the book for Australians.

Our copy from the publishers, Macmillan and Company Ltd., London.

Essentials of Good Milking.

The essentials of good milking (points out a publication of the English Ministry of Agriculture) are that it should be performed quietly (that is, with no discomfort to the cow), quickly (rapid milking appearing to increase the flow), and thoroughly—the last milk, being the richest, should always be withdrawn.

In the milkers' contest held at the London Dairy Show, in which no competitor is allowed to milk his own or his employer's cows, the following are the points upon which competitors are judged :—(1) Manner of approaching the animal, and style of work, 20 points ; (2) cleanliness, 10 points ; (3) clean stripping, 10 points ; total, 40 points.

Rat Control in Hawaii.

Interesting information concerning the methods adopted for rat control in Hawaii is made available by Mr. David G. Stead, a member of the New South Wales Government delegation to the recent Pan-Pacific Food Conservation Conference at Honolulu. The introduction of the Indian mongoose appears to have proved anything but a profitable measure, the animal having itself become a pest without having proved its efficacy in the way desired. "The consensus of opinion among experienced hands here," comments Mr. Stead, "is that he has proved to be a 'a very poor ratter,' while at the same time being a standing menace to poultry and bird life generally." It is appalling to think, he adds, what might happen if those in favour of the animal's introduction into Australia as a means of controlling rats and rabbits had their way.

Some years ago rats began to manifest themselves in something approaching plague numbers in Hawaiian cane fields, and—protected as they were by the forest of cane stems—they multiplied rapidly and began to destroy considerable quantities of the cane itself and of certain fruits. With the failure of the mongoose, mechanical means of control have had to be resorted to on a large scale, while poison is often freely used. A method advocated is the use of barium carbonate baits, the procedure being first to set unpoisoned wheat (in five places to the acre) for a period of about two weeks until every rat and mouse knows where it is, and then to substitute poisoned baits. This is done three times a year, with such success that the 1924 crop of cane harvested at Honokaa (an important plantation) showed practically no rat-bitten cane and the plantation got fully sixty thousand dollars worth of sugar which had hitherto gone to feed the rats. The total cost of the work here has been about five thousand dollars annually.

Another method of using the poison is to prepare a dough with one part barium carbonate to three of flour, rolling this thin, stamping it into tiny biscuits, and finally drying these and coating them with paraffin.

How Denmark Became Prosperous.

The Danes were once a seafaring, war-making, poverty-stricken people. Now they are agricultural, peace-keeping, and prosperous. How did they do it?

During the Napoleonic wars they sided with the French. The English and Germans beat them. Their navy was sunk; they lost most of their colonies. Germany took all of the southern part of their country, which was by far the best part of it. By the latter part of the nineteenth century these defeated, poverty-stricken people were thrown back to make a living out of the poorest land in Europe.

Then what did they do? They did not emigrate to other lands; they did not submit themselves to be ruled by their aristocracy; they did not appeal to their government to help them. They did a very unusual thing—they helped themselves. They formed an association of neighbours to do things together; they pooled their intellectual power so that everybody in the pool should get the advantage of the best brains; and they settled down to work out their problems on the spot.—*Southern Planter.*

Field Experiments with Maize.

GRAFTON EXPERIMENT FARM.

DE-SUCKERING EXPERIMENTS FOR 1919-24 SUMMARISED.

G. NICHOLSON, H.D.A., Experimentalist.

It is a prevalent idea among farmers that the removal of suckers from a maize crop increases the yield. The opinion seems to receive strong support in districts where or seasons when dry weather prevails at tasselling time. Particularly is this thought if during the early period of growth seasonable conditions have been favourable to the development of suckers. It is considered by some that suckers rob the main plant of nutriment which should go to build up the ear.

A rich soil, ample moisture, good cultivation, early sowing, and a thin stand favour prolific suckering. In a thinly-sown crop, or where a thin stand has been obtained, it is possible that a number of the suckers may produce small ears. Under the conditions under which the following experiments were conducted this condition of affairs was not likely to be the case, as a good stand, sufficiently thick for the soil utilised, was always obtained.

The experiments were commenced during the season 1919–20, with the view of obtaining definite information on the following points:—

(*a*) To what extent does the de-suckering of maize increase or decrease the yield ? Conclusions to be drawn from comparison of results from untreated and de-suckered plots.

(*b*) Weight and value of suckers from de-suckered plot.

(*c*) Cost of de-suckering.

In an experiment of this nature it is desirable that a variety be used that has a tendency to sucker freely, and it was mainly on this account that Leaming, which possesses this characteristic, was chosen to sow the experiment. The plots occupied a permanent site on dark alluvial soil— of fairly uniform type, and resembling the alluvial soil of the district. The land had previously been cropped with maize for a number of years. No fertiliser was used.

Notes on Seasons.

1919–20.—The experiment was sown on 17th December, 1919, in rows 4 feet apart, three grains being dropped every 40 inches in the rows. Five inches of rain fell during December, followed by 5½ inches in January, and these good rains prior to tasselling were favourable to the development of suckers. One ton was removed from the de-suckered plot. Subsequent

rains were fairly evenly distributed, and totalled 9 inches. A difference of only two-thirds of a bushel was noted between the two plots in favour of the untreated one.

1920–21.—Heavy floods were experienced during the winter of 1921, damaging much of the maize, and no yields were recorded.

1921–22.—It is recognised that the sowing of single grains tends to the formation of a greater number of suckers than when maize is sown in "hills." With this in view, a change in the method of seeding from "hill" planting to single grains every 15 inches apart was made. As early-sown maize tends to sucker more freely than that sown later, the time of planting was also changed, and the experiment this season was sown on 26th October, 1921. The season was dry during the early period of growth, only 135 points falling in November, but this was followed by nearly 7 inches in December. De-suckering was carried out on 11th January 1924, and 23 cwt. of suckers were removed. In January only 22 points of rain fell, followed, however, by nearly 10 inches during the next month (February). Yields favoured the untreated plot. which returned more than 6½ bushels in excess of the de-suckered one.

1922–23.—The experiment was sown on 27th October, 1923, the method of seeding being similar to the previous year. The rainfall prior to tasselling was 96 points in November, and 165 points in December; these dry conditions resulted in a poor growth of suckers, and only 8 cwt. were removed. The season was very dry throughout, and the removal of the suckers, instead of increasing, tended to slightly decrease the yield.

1923–24.—Sowing was carried out on 30th October, 1923, in a similar manner to the preceding two years Although the spring was particularly dry, good rains in December (434 points) and January (347 points) favoured a vigorous growth of suckers; 28 cwt. of these were removed on 6th February, 1924. During February 3 inches of rain fell, 188 points in March, and 149 points in April. The dry conditions prevailing after tasselling, according to the popular theory advanced by farmers, should have favoured de-suckering, but this plot yielded 13 bushels less than the untreated one.

YIELDS from Untreated and De-suckered Plots, and Weights of Suckers Harvested.

Treatment.	1919–20.	1921–22.	1922–23.	1923–24.	Average
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Untreated	70 36	48 1	30 46	62 0	52 29
De-suckered	69 55	41 34	29 16	49 15	47 30
	ton.	c. q. lb.	c. q. lb.	c. q. lb.	c. q. lb.
Weight of suckers harvested ..	1	22 3 26	8 1 10	27 3 12	19 3 5

PROFIT and Loss Statement.

Year.	Increased Yield due to allowing Suckers to Develop.	Value of Increase.	Weight of Suckers Removed.	Value of Suckers.	Cost of Removal of Suckers.	Net Increase due to allowing Suckers to Develop.
	bus. lb.	£ s. d.	cwt.	s. d.	s. d.	£ s. d.
1919–20	0 37	0 5 0	20	15 0	15 10	0 5 10
1921–22	6 23	1 7 3	23	17 2	17 6	1 7 7
1922–23	1 30	0 8 5	8	6 3	8 1½	0 10 3½
1923–24	12 41	1 8 3	28	20 11	17 0	1 4 4
Average of all years	5 16	0 17 3	20	14 10	14 7½	0 17 0

The valuations in the computing of the above figures were as follows:—Suckers, at 15s. per ton. Price of maize on farm: 1920, 9s. 6d. per bushel; 1922, 5s.; 1923, 5s. 6d.; 1924, 3s.

It will be noted that the untreated plot (*i.e.*, not de-suckered) over a period of four years returned 17s. per acre more than in the case where de-suckering was practised.

Conclusions.

The following conclusions are indicated as to rainfall in relation to the development of suckers and de-suckering:—

1. The development of suckers is favoured by good rains prior to tasselling.
2. A low rainfall up to tasselling retards their development to a great extent.
3. In most seasons suckers do not rob the ear of nutriment, but on the contrary are advantageous to its development.

Due consideration must be given to the food-value of suckers obtained from the de-suckered plot. In years of ample rainfall their development is greatest, hence the cost of harvesting will be lower per ton than in drier seasons. Grasses and other herbage are plentiful in good seasons, therefore their value decreases accordingly. The fodder value of the suckers barely compensated for the cost of harvesting them, so from this point of view de-suckering is not warranted. A reasonable increase in the yield of grain must, therefore, be assured before this treatment can be recommended. The average results of this experiment show that de-suckering reduced the yields of grain by over 5 bushels.

It would appear that the suckers are the normal part of the plant, from the leaves of which material is manufactured and transferred to the main stalk to assist in the development of the ear. De-suckering as a means of increasing the yield has in the past been much over-estimated.

Good Bull and Scrub Bull.

If one were to summarise the experience of Kansas dairy-farmers in the profitable conduct of their business it would be expressed in one short sentence: "Get a good bull." It costs no more to feed a good bull than a scrub, and the scrub is a sure money loser. Nothing will tear down a good herd so fast or so completely as a scrub bull. The descendants of a scrub bull soon cease to be cows in any profitable sense, and become mere walking appetites. If there is a mortgage on the place the scrub bull will hasten the day of foreclosure, but if one does not have a mortgage and still keeps a scrub bull, he will soon have both.—"Dairying in Kansas."

Further Experiments in the Storage of Lemons.

A suggestion by Mr. H. Fester, Kenmore, *via* Goulburn, that lemons might be preserved by coating them with a casein and lime paste prompted the carrying out of further experiments in the storage of this fruit at Yanco Experiment Farm last season. Casein (4 oz.) and finely powdered slaked lime (three-sixteenths oz.) were mixed dry, and 24 fluid ounces of water then added, stirring well all the time. The mixture was applied to the fruit with a woollen rag, some of the lemons being afterwards wrapped and some packed unwrapped. A number of lemons were also treated with vaseline, and some packed untreated as checks. The date of treatment was 22nd July, 1924. The fruit was picked (cut) when well on the turn, and sweated for fourteen days. Examination on 23rd September gave the following results:—

	Treatment.	Condition when Examined.
Case 1.	Vaselined and packed unwrapped.	Eight bad. Condition fair.
,, 2.	Vaselined and wrapped ...	Two bad. Condition good.
,, 3.	Check. No treatment, unwrapped.	Sixty-five bad. Condition poor.
,, 4.	Check. No treatment, wrapped.	Fourteen bad. Condition medium.
,, 5.	Smeared with casein and lime, unwrapped.	Six bad. Condition medium.
,, 6.	Smeared with casein and lime, wrapped.	Five bad. Condition fairly good.

Mr. W. W. Cooke, Orchardist, reports:—

"As the lemons which were wrapped as well as treated with vaseline or casein and lime kept much the best, the time taken to unwrap, remove the vaseline or casein, and again wrap and pack a half bushel was noted. This was as follows: Vaseline, 24 minutes; casein and lime, 46 minutes. Purchased in small quantities, casein costs 2s. 6d. per lb and vaseline 1s. per lb. About 4 oz. of casein would be required to treat a bushel case; the amount of vaseline used would be 2 oz. or less for the same quantity of fruit. The total cost for material and time required to treat and wrap the fruit in the first place and later to remove the treatment and again wrap and pack would be:—Casein and lime treatment, 3s. per bushel; vaseline, 1s. 9d. per bushel. When large quantities of fruit are being treated the time required for treatment could no doubt be considerably reduced."

Care of Milk and Cream.

H. D. BARLOW, H.D.A., Senior Dairy Instructor.*

CONTRARY to the belief of a large number of dairymen, the factory manager or grader does not class cream as "second-grade" if it can possibly be avoided. In fact, the majority of factories, in their efforts to assist the farmers, are rather inclined to stretch a point in favor of their suppliers, and pass as "choice," cream which is rather doubtful, in the expectation of improving it during the process of manufacture.

Very largely because of this tendency, managers occasionally receive word from Sydney that a consignment of butter has been classed "first" or "second grade," instead of "choicest" on its arrival there, and as a result o. this short-sighted policy the whole of the suppliers may have to pay the penalty for the carelessness of a few. It is true that the penalty has not been very heavy in the past, and the risk may have seemed justifiable at the time, but now that an Australian national export brand is in operation, the margin of price between "choice" and inferior grades is likely to be much greater. It will necessitate more strict and careful grading of the cream at the factory, and, unless scrupulous cleanliness and attention to details are carried out on the farms, this will reflect itself adversely in the dairyman's monthly cheque.

Dairymen can take it for granted that the cream-grader at any factory knows the difference between good and bad cream, and if cream is classed as an inferior grade it has an off-flavour or taint of some description or other. The cause is to be found somewhere between the cow and the factory, and can usually be cured by cleanliness and attention to detail—not by assuming that all the conditions it was produced under are ideal, and that the factory manager or grader is wrong.

Cream which is graded as inferior "first" or "second" grade or class at the factory is known as "tainted cream," and the origin of the taints might be divided into four sections:—Food taints, absorbed taints, chemical, and bacterial taints.

Food Taints.

Food taints are somewhat outside the control of dairymen as a rule, as they are caused by the food eaten by the cows, but in the case of pastures which are known to contain large quantities of lucerne, clover, and allied fodders, a big improvement can be made in the cream flavour if the cows are kept off these pastures, if possible, for at least three hours before milking.

Aerating the cream by using a cooler is also very beneficial.

* Notes of an address given to Channon Branch, P.P. Union, 17th September, 1924.

Cows eating carrot weed give an exceptionally badly tainted milk, and of all the food taints common in most dairying districts this is probably the worst, as it does not improve in any degree when treated at the factory, and causes a very objectionable and lasting flavour in the butter.

Most other food flavours can be improved to a greater or lesser degree by the treatment which the cream receives at the factory, but, nevertheless, have a tendency to lower the quality.

Absorbed Flavours.

Butter-fat has the property of readily absorbing the odour of anything placed in close proximity to it; therefore, milk or cream should never be stored near any fruit, kerosene, etc.

One of the commonest absorbed taints met with in cream is that due to the oil fumes of the engine driving the separator, either from the exhaust or from leaky valves.

The safest method of getting over this difficulty is to run the exhaust pipe through the roof. Particles of oil or other matter thrown out by the exhaust should not be allowed to lodge on the roof if rain water is used in the dairy. If the roof water is so used a small tap should be placed at the lowest point to drain off any condensed water; no trouble then will be experienced. Leaky valves and joints can be avoided with ordinary care.

If possible, to minimise the risk of contamination, the engine should be in a different room to the separator, and the belt put through the wall.

Bacterial Taints.

Butter-fat itself is not a food for bacteria, which live on the other constituents of milk, *i.e.*, casein, milk sugar, and albumen.

The smell from bad cream is due to decomposition as much as the smell from a decomposing animal body. The bacteria in the cream live in the constituents mentioned, and, by their action, change their chemical composition, thus causing more or less objectionable taints, according to the class and number of bacteria present, and in extreme cases the chemical composition of the butter-fat is affected.

Butter-fat is readily susceptible to chemical change, even without the action of bacteria, and the two commonest forms of chemical taint we know as tallowy and metallic.

The particles of fat easily become oxidised if left in contact with warm metal surfaces, and if a large surface of cream is exposed to the air and allowed to dry on the top. No treatment will improve cream affected with either a tallowy or metallic taint, and the process of heating during pasteurisation has a strong tendency to increase the defect.

Metallic taint is usually associated with thin, high acid cream, and old, rusty, or badly kept utensils, and tallowy taint is generally connected with stale cream—probably rich in butter-fat—which has not been carefully looked after, greasy utensils, or exposure of the surface to the air too long without stirring.

These taints, although they may not be very marked nor objectionable, if mixed with fresh cream when the cream arrives at the factory, will continue to develop in the butter, and the factory manager will then be notified that his butter has been graded down.

These two taints, metallic and tallowy, are particularly stressed, as both will cause a tallowy flavour in the resultant butter, and this is one of the worst troubles the butter-maker has to contend with at the present day. Therefore, cream of this nature must always be classed as "second grade."

To return to bacterial taints, it is advisable to know that bacteria are the smallest form of vegetable life known to science, and are individually invisible without the aid of a powerful microscope. They pervade everything and everywhere, and, while they perform necessary and useful functions in the world, as far as dairymen are concerned they are largely detrimental to their product.

Under commercial conditions it is impossible for any farmer to supply cream wholly free from bacteria, but careful attention to a few simple details will greatly lessen the bacterial content of the cream. As an example, a cubic centimetre of ordinary "choice" cream may contain up to 1,000,000 bacteria, but bad cream may contain hundreds of millions per c.c.

Three conditions are essential to bacterial life, *i.e.*, food, heat, and moisture. Bacteria generally reproduce by fission or dividing into two, and given ideal conditions will perform the action about every half hour.

The dairyman cannot help the fact that cream is a good food for bacteria; neither can he help the presence of moisture; but by separating his cream thicker in summer time he can reduce the available food (casein, milk sugar, and albumen), and check the bacterial development.

The only other controlling factor left is heat. The ideal temperature for bacterial development is about blood heat, that is about the temperature of the milk when drawn from the cow, and also the average atmospheric temperature in Australia in summer time—90 deg. to 100 deg. Fah. The lower the temperature the cream is reduced to after separating, the greater will be the check to bacterial growth, since practically no development takes place at 60 deg. Fah., or lower; therefore, if the temperature can be reduced to 70 deg. to 80 deg., a noticeable improvement in quality can be expected.

Sources of Infection.

Most of the troubles in cream are caused by organisms closely associated with cow manure. Milk in the udder of a healthy cow in normal condition is practically free from bacteria, but directly it is drawn from the cow by the ordinary milking process it may contain many thousands per c.c. The first point of infection is the teat. Cows lying down will often squeeze out a drop of milk which becomes infected with bacteria from the ground. These work up through the teat canal and multiply rapidly. Thus the first milk passing through the teat generally contains large numbers of objectionable organisms,

and dairymen are strongly advised to discard the first few squirts. Practically nothing will be lost by doing so, as it has been definitely established that this first milk contains practically no butter-fat.

Another early cause of infection is the dust from the cows' flanks and udders falling into the milk bucket. To prevent this the udders and flanks should be washed before milking, and this has the added advantage that cows so treated are not so liable to get sore teats, and the milkers are seldom troubled with sore hands. If a little disinfectant, such as formalin or Condy's crystals, is added to the water, better results still will be obtained.

The bails and yards should at all times be kept free from dry cow-dung and dust.

Unclean buckets should be avoided, and in this connection it is well to remember that no dairy utensil is clean unless it has been scalded in boiling water after washing. This will destroy any bacteria which might remain, and the utensil will dry immediately. Always remember that water which has been boiled some distance away, carried over to the washing-up bench and allowed to stand five minutes, is not boiling water, and its efficiency and germ-killing properties are practically lost. Clean hands and clean clothing are almost as important as clean utensils. No one would advocate not straining the milk, yet a dirty strainer (cloth or gauze) is worse than no strainer at all.

It is sometimes noticeable at the bails, that after one bucket has been emptied, certain foreign substances have been intercepted by the strainer. These are left there, and the next bucket of milk poured in When this has been done a few times, the foreign substance has disappeared—dissolved and washed into the milk. Of what advantage is it to use a strainer in such a manner? Very little time would be lost by either shaking out or rinsing the strainer, and large numbers of objectionable organisms would not be added to the milk.

Unclean cream cans are a bad source of infection, and no man can be certain of getting "choice" cream if they are not washed, scalded, and allowed to cool before using. If this is not done and the cream is still graded as "choice," it is a case of more good luck than good management, in the same way as one person may be in a room with a patient suffering from an infectious disease and not contract it.

Separators should be thoroughly washed and scalded both night and morning. The modern separator is comparatively easy to clean, and to get the best results the parts, when washed, should be placed in boiling water. When taken out the heat will cause the metal to dry rapidly and lessen the chance of rusting and deterioration ; the boiling water will kill any germs which may remain.

From the point of view of public health, the dairyman who does not wash his separator at night time should be prosecuted, even if the results are not bad enough to affect his pocket.

If petrol tins are used to keep the cream in, the seams at the bottom and side should be filled with solder before they are used; otherwise they are a source of danger.

If the point of a penknife is run along the seams of a petrol tin which has been in use for some time, a yellowish, rusty slime will usually be collected, even if the tin seems quite clean. This slime is practically a bacterial culture and may seriously contaminate the cream.

The rules which apply to keeping dairy utensils clean are also applicable to the cream and separator rooms. Second-grade cream has often been traced to the floors of these rooms. Milk and cream is spilt and gets into the cracks in the floor, bacteria develop there, and eventually float up into the air and contaminate the cream. Floors should be washed each day with boiling water and soda and scrubbed with a broom, and if the floors are well drained they will dry in a few minutes, and always keep sweet and clean. Using the wash-up water to wash the floors is a very foolish and objectionable practice, as this water contains a certain amount of milk constituents, which remain on the floor and form an excellent breeding ground for bacteria.

All shelves, tables, stands, etc., should be thoroughly scrubbed and allowed to dry each day, since if allowed to become sour they are often a source of trouble.

The reason for not washing utensils with boiling or very hot water to start with is that the albumen will coagulate and stick to the utensils in a thin, often invisible film, and supply a breeding ground for bacteria.

Cream, when stood at the road-side, waiting for the carter, should be carefully protected from the heat of the sun, since, if allowed to get warm, rapid deterioration will take place. This is a matter which is easily controlled, and every dairyman should be careful about it, as although sufficient deterioration may not take place immediately to warrant the cream being graded down at the factory, nevertheless the chemical and bacterial changes which are likely to take place in heated cream tend to have a detrimental effect on the keeping quality of the resultant butter.

Many dairymen seem to be under the impression that once their cream is placed at the side of the road, their responsibility is ended. This is not so, as they are mostly suppliers to co-operative factories—and all factories are co-operative, in as much as every supplier is dependent to a certain extent upon the quality of the article forwarded by the others.

Farmers should take action if they see cream-carriers not using their curtains to protect from the sun the cream they carry. If cream has to be carted any distance in summer in the dairyman's cart, covering the can with a clean wet sack will have very beneficial results. Even on dull days, always keep the cream cans covered.

Coolers.

If used properly under clean conditions, nothing will give better results than a cream-cooler, several very efficient types of which are now available with a water bag, at a comparatively low cost. Besides considerably lowering

the cream temperature, and thus checking bacterial development, coolers aerate the cream, release gases, food flavours, etc., and improve the body and consistency of the cream. If coolers were universally used, there is no doubt that a marked improvement in the quality of the cream would result.

Care should be taken thoroughly to wash and boil a cooler after use, or otherwise it may become a source of infection.

It is advisable always to mix creams immediately the fresh cream is cool, and not keep the lots separate until delivery. Stir cream with a metal stirrer several times a day.

Conclusion.

To make certain of always producing the highest quality cream, care and scrupulous cleanliness are essential during all the stages of production, and the surroundings, as well as the inside of the bails and buildings, should be kept clean and free from all contamination by dust, objectionable smells, etc. Remove the skim milk tank after each separating.

The value of plenty of boiling water (200 deg. to 212 deg. Fah., not 140 deg. to 150 deg. Fah.) and soda for washing purposes cannot be over-estimated; and coolers, if properly used, must have a decidedly beneficial effect.

Finally, deliver the cream to the factory daily during the summer months, if at all possible.

In the event of any farmer having trouble with the quality of the cream, the Dairy Branch, Department of Agriculture, is available and only too willing to give all the assistance possible, at no expense to the farmer, and to endeavour to find the cause of the trouble.

Dehorning of Dairy Cattle.

The dehorning of calves is best accomplished by the application of caustic to the horn "buttons," the two small protuberances which can be felt when the animal is a few days old on either side of the poll where the horns emerge. The skin immediately surrounding each button should first be protected by smearing it with vaseline, and the button itself then carefully rubbed with the caustic pencil. Should the caustic touch the skin severe burning will occur and areas of skin will slough off. For the same reason, the caustic must not be handled with the fingers, but slipped for use into some metal holder, such as an ordinary pencil-holder. Four applications are usually sufficient, when the buttons will peel off, this marking the completion of the treatment.

The operation is thus performed without any pain to the animal, and the method is quite the most effective and humane. Adult cattle are sometimes dehorned by use of a special instrument, several kinds of which are on the market, but it is a painful operation and is not recommended.

If cattle prove troublesome in the yard by horning others, much damage can be prevented by sawing off the ends of their horns, leaving them quite blunt. Care should be taken not to remove too much of the horn, and the sawn ends should not be filed round.—Max Henry, Chief Veterinary Surgeon.

An Uncommon Watercore Condition in Apples.

W. A. BIRMINGHAM, Assistant Biologist.

On 17th April, 1924, a case of King David apples was forwarded by Mr. H. W. Eastwood, orchardist at Wollongbar Experiment Farm, to the Biological Branch for examination. In a letter accompanying the specimens Mr. Eastwood wrote: "The case of apples I consigned to you on 16th inst. was a sample of a consignment forwarded to Lismore. . . It first appears as small greenish dots, mid-way between the core and skin, if the apple is cut transversely. These gradually enlarge, assuming a glassy appearance, and finally unite, forming a complete circle, spreading both inwards to the core and outwards to the skin. The apple finally becomes a rotten, putrid mass. . . . They show no visible signs of the disease, and have every appearance of being perfectly healthy until they are cut. When I condemned a consignment of sixty cases, naturally the market slumped."

Our examination outwardly showed no indications of any defect, but on cutting through the fruit transversely, it was found that a more or less stellate-shaped watercore ring encircled the interior of the fruit, being ¼ to ½ inch removed from the surface, the outer margin of the ring being brownish in colour (Fig. 1). From 80 to 90 per cent. of the fruit was affected in this way, only odd apples showing the initial stages of the condition. The normal structure of the apple is shown in Fig. 2 (transverse section).

It will be seen that there are ten primary vascular bundles (conducting channels). It is here that the condition we are dealing with appears to have its origin, extending out into the flesh (cortex of the fruit). The cells in that part of the apple (shown white in figure Fig. 1) are largely filled with air, giving them a white, mealy appearance, whereas those in the watercore (darkened) area, together with the intercellular spaces (spaces between the cells), are completely filled with sap. The cells normally are more or less spherical in shape and only touch one another in parts; the spaces left where they are not in contact are known as the intercellular spaces and are normally filled with air. In watercore conditions they are filled with sap, giving the tissues a transparent or glassy appearance.

The writer communicated with the agents in the district in which the fruit was grown to obtain the history of the crop prior to maturity until the time of its disposal.

The information supplied from two sources was:—

1. The February and March rainfall last season was excessive and caused delays in picking.
2. The King David variety is noted in this district as being susceptible to watercore.

3. The apples were picked at an advanced stage of maturity. I think they had been held on the trees too long
4. They were on the market within about ten days of picking.
5. There were no external signs of watercore, but on cutting considerable watercore was present.
6. They were only held in the shed about three days, including time of packing, and after stacked in comparatively thin stacks, *i. e.*, they would be six high and three deep.

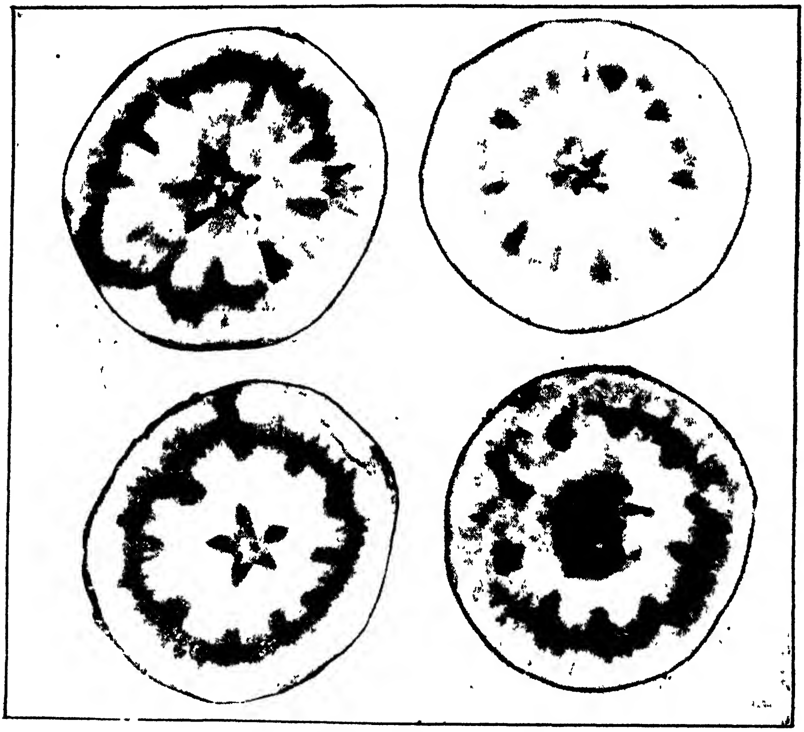


Fig. 1.—Watercore Condition in Apples.

Found at Lismore in Fruit Grown at Batlow.

7. All the fruit was the produce of one grower, was despatched to the shed as soon as possible after picking, and was dealt with within twenty-four hours of its arrival at the shed, as it was recognised by the grower and ourselves that they had been left hanging too long.
8. The trees from which these King Davids came are well-matured trees which had run somewhat wild, and the last two years have *been cut rather severely to pull them* into shape.

It has been shown that conditions affecting transpiration are the prime factors inducing watercore. Factors affecting transpiration are:—

(*a*) Excessive or strong vegetative growth, especially in young trees just coming into bearing. Such trees generally set light crops and the fruits are abnormal in size.

(*b*) Excessive precipitation or irrigation shortly before the maturity of the fruit, if followed by extremes of temperature and atmospheric humidity, are factors of great importance. During the day-time, when the temperature is high, the roots are absorbing water at a

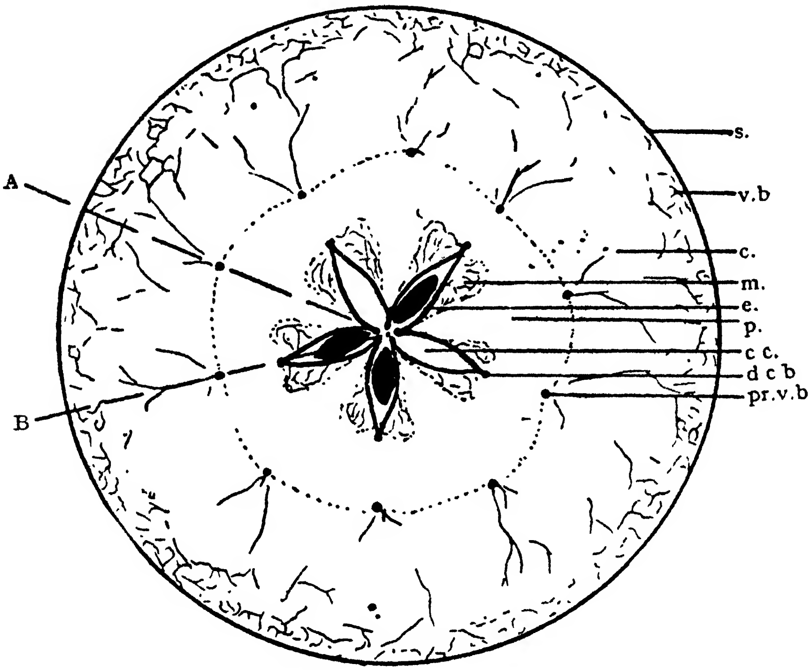


Fig. 2.—The Internal Structure of the Apple.

c—Cortex. *cc*—Carpellary chamber. *dcb*—Dorsal carpellary bundle. *e*—Endocarp (= cartilaginous layer) of carpel. *m*—Mesocarp and exocarp (= flesh) of carpel. *pr. v. b*—Primary vascular bundle. *s*—Skin. *v b.*—Vascular strands in cortex. The dotted line indicates the boundary between the pith and cortex.—*After Kidd and West.*

rapid rate and transpiration keeps pace. At night the temperature falls considerably, the soil is still warm, and the roots continue to absorb freely, but the leaves do not transpire as freely, owing to the cooler atmosphere. The consequence is that the excessive sap is forced into the spaces between the cells, *i.e.*, the intercellular spaces. If the atmosphere is heavily charged with moisture, transpiration is checked and the sap forced into the intercellular spaces.

(*c*) If defoliation is brought about by some pathogenic organism or other cause shortly before the time of ripening, the fruit is likely to suffer

from watercore. The diminished leaf surface means a reduction of the evaporating area, resulting in an excessive accumulation of water in the fruit.

(*d*) Frosts which are severe enough to injure the foliage have a similar effect to defoliation, since the leaves which are so injured no longer function as true agents of transpiration.

Factors which appear to have been responsible for watercore in the variety, King David, previously referred to, are:—

1. A susceptible variety under conditions favouring the development of watercore.
2. Excessive rains when the fruit was maturing.
3. Heavy pruning.
4. Allowing the fruit to hang too long.

Watercore or glassiness is a physiological condition and not due to any organism.

Control.

The following recommendations may be expected to reduce the amount of watercore, but complete control appears to be out of the question:—

(*a*) Adequate provision for drainage.

(*b*) Endeavour to maintain the control of fungus and insect pests causing defoliation.

(*c*) Light pruning in the case of susceptible varieties.

(*d*) Where irrigation is practised, the water should be applied in reasonable quantities, particular care being taken just prior to the ripening of the fruit.

I am indebted to Mr. W. J. Reay for the photographs accompanying this article, and to two gentlemen who answered my questionnaire.

A Plant Disease Leaflet, No. 26, on "Glassiness or Watercore of Apple," is issued by the Department of Agriculture to growers on application, free of charge.

Return of Infectious Diseases Reported in November.

The following is the return of outbreaks of the more important infectious diseases reported during the month of November, 1924:—

Anthrax	3
Contagious pneumonia of swine	Nil
Pleuro-pneumonia contagiosa	1
Piroplasmosis (tick fever)	1
Swine fever	Ni

—Max Henry, Chief Veterinary Surgeon.

A Strange Case of Robbing by Bees.

W. A. GOODACRE, Senior Apicultural Instructor.

ONE scientific discovery frequently leads to further information being brought to light, and a close investigation at Wauchope Apiary recently of the transference of honey from one bee to another for the completion of the ripening process (discussed in the October issue) disclosed the fact that transference takes place apart from direct association with the ripening process.

A medium-sized swarm had been hived at the out-apiary, and the bees allowed to settle down. Seven frames of brood were then given this swarm colony, the idea being to form seven queen-rearing nuclei colonies. The colony was transported to the home apiary and immediately divided, each nuclei being given a ripe queen cell. The weather conditions had been adverse, rain having fallen for five days so continuously as to prevent the bees in the main apiary obtaining anything from the fields. Very little inducement would therefore be necessary to start robbing, and it was for this reason that the swarm colony from the out-apiary had been selected, as in such event they would protect their home well.

After forming the nuclei from the swarm colony there were still three frames of foundation with a good number of adhering bees left, and these bees were shaken in front of each nuclei. Most of them had entered their respective hives when robber bees were noticed to be about. It was decided, although there were a few bees about the hives, to put grass in the hive entrances to minimise any risk of robbing. The action of the bees outside the hives attracted attention, and the first impression was that they were transferring honey from one to the other. It soon became evident, however, that robber bees were busy relieving the young bees of their honey-sac supplies. The robbers knew their marks well, and would proceed in a very determined manner to demand the young bees' supplies. It was not uncommon to see as many as three and four robbers operating on the one victim, the latter usually a bee of not more than about six or seven days of age. The action of the robbers was similar to that observable during transference about the hive entrance during the honey flow, though there was more excitement, of course. This robbing of the young bees caused quite a little commotion, and had there been a large number of young bees some trouble would have been caused.

Next morning at 5 a.m. another very interesting aspect was observed. The grass from the nuclei entrances had been removed the previous evening, and the bees were just getting about. There were a few robbers flying, and it was decided for the time being to replace the grass. Several bees were again shut out and again molested. It was noticed that sometimes while a

robber was demanding by its actions the supplies of a young bee, or while busy at this robbery, it would itself be attacked by a bee from the nuclei. This went on for some time, the robbers taking every opportunity to molest the young bees, while others from the hive came to the young bees' assistance and drove the robbers away.

The young bees—in fact, all the bees in the colony brought from the out-apiary for the forming of the nuclei—would, after the shaking up in transportation, have well-filled honey-sacs. The robbers took advantage of this, knowing, no doubt, that when a supply is demanded of a young bee it will be given up. It is evident from these investigations that robbing tendencies can be induced not only by leaving honey accessible, but also by leaving young bees available to the robbers. Had our nuclei been weak ones, or had care not been taken to prevent undue excitement, there would have been trouble.

An International Institute of Co-operation.

A development of considerable significance in agricultural co operation is the decision reached unanimously at a meeting of farmers' organisations and co-operative undertakings held at the Department of Agriculture, Washington, U.S.A., and attended by the late Secretary for Agriculture, Mr. H. Wallace, to hold a conference this year for the purpose of founding an International Institute of Co-operation in the United States.

The project is purely educational. In a memorandum setting out the aims and purposes of the Institute (says the *Journal* of the Ministry of Agriculture, London), its promoters observe that the general conception of the principles underlying the co-operative movement is vague, uncertain, and idealistic, and that a more thorough understanding of the theory, history, and technique of co-operation is necessary if the successful application of these principles, and the realisation of their acknowledged possibilities for good to the business interests and general welfare of the country, are to be accelerated.

The immediate objects of the conference are stated to be :—

1. To collect and make available a body of knowledge concerning the co-operative movement in the United States and in other lands.
2. To serve as a means of clarifying thought as to what the co-operative movement really is, and of bringing about more harmony and unity of action among organisations directly or indirectly connected with co-operation.
3. To serve as a means of training and developing leaders and workers in respect to co-operative theory and practice.
4. To serve as a means of assisting educational institutions to improve their teaching courses in co-operation.
5. To focus the spirit of the co-operative movement as a means of community and national development.

The session will last about four weeks, and it is the intention of the organisers to invite to America for the occasion the leading authorities on the co-operative movement in various parts of the world, as well as a number of students.

Spraying Vines with a Spray Gun.

W. W. COOKE, Orchardist, Yanco Experiment Farm.

TRACTOR spray outfits for vineyards have long been used, and their advantages as well as their failings recognised. One of the disadvantages of a tractor is its unsuitableness for spraying fruit trees. As many mixed orchards contain vines as well as fruit trees, their owners are faced with a

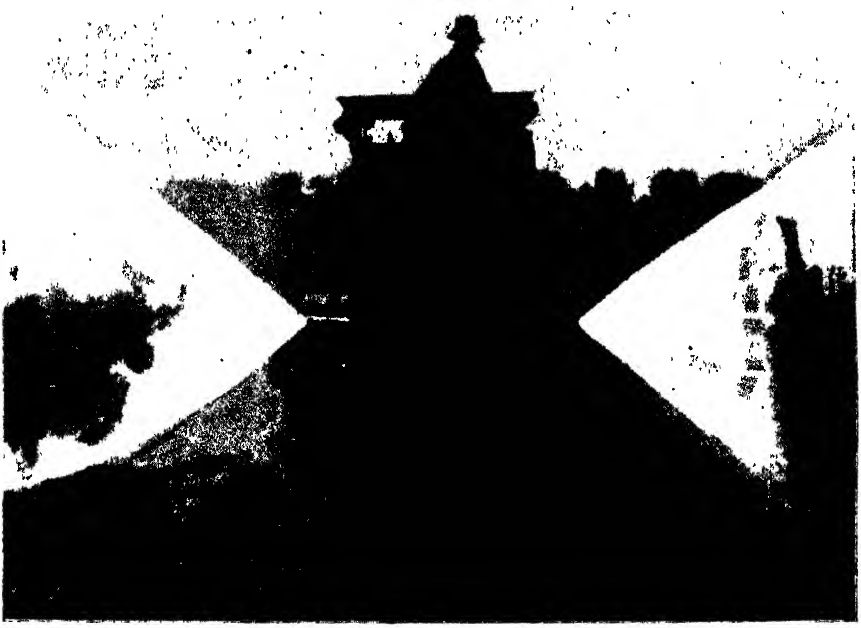


Fig. 1—A Novel Application of the Spray Gun.

difficulty. They must have a suitable outfit to spray their trees. If the orchard is one of 20 acres or over, the outfit used will probably be a motor spray pump. An arrangement by which this can be used in a manner similar to a tractor for spraying that part planted with vines, being quickly changed to a form suitable for spraying fruit trees, would be of considerable advantage. This has been found possible by a method adopted on this farm, the loss of time in changing being not more than ten minutes.

To the spray pump used to spray fruit trees on this farm, two spray guns are attached in place of rods and nozzles. When a disc with a fairly large hole is used, and the gun is closed down so as to almost shut off

the spray, a fine wide-angle spray is thrown which covers well the growth made by the vines up to the third spraying or later. Fig. 1 shows this outfit giving the second spraying to Zanté currants on 21st October, 1924. It will be seen by this that the cone of spray is a large one, and that the growth is being well covered.

Figure 2 shows how the guns are attached to the pump. Two pieces of 2 by ¼ inch iron 2 feet 6 inches long are fastened upright to the frame of

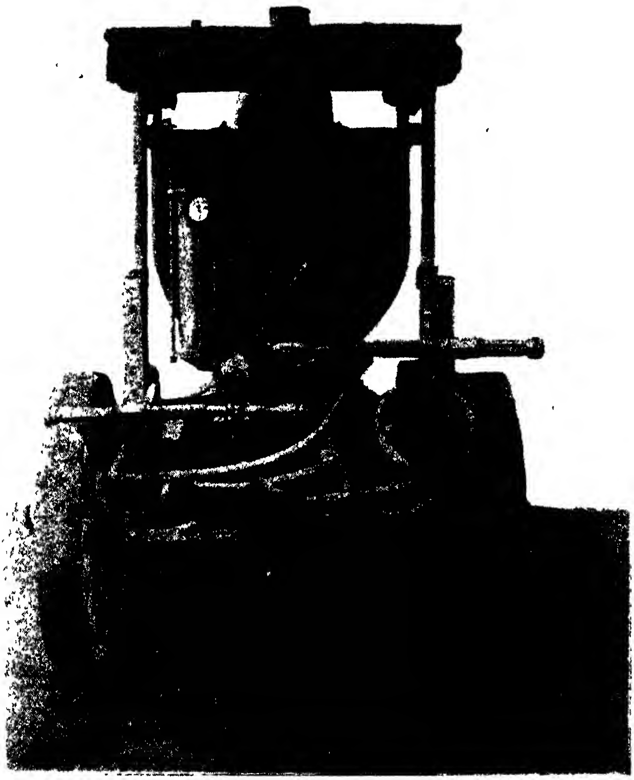


Fig. 2—How the Spray Guns are attached.

the pump so as to project about 9 inches. Half-inch holes are drilled in these about every 3 inches. An L-piece of 2 by ½ inch iron is bolted to each upright, the arms of the L measuring about 5 inches, though it is advisable —this method is not illustrated—that one should project 2 or 3 inches more from the upright so that the fact that their handles overlap does not prevent the guns being on the same plane. To each of the pieces an iron "hand" is bolted to hold the gun. Fig. 3 gives a better idea of

how this is arranged. The iron hand is shown at (a), the L-piece bolted to the upright and carrying the hand is shown at (b), while (c) is the frame of the pump.

This arrangement allows the guns to be raised or lowered 2 feet 6 inches; also the spray can be directed up or down, or in the direction the pump is travelling or the reverse. This allows alterations to be made to suit different heights of trellis, and to a certain extent to counteract the action of the wind. In Fig. 2 short lengths of hose are shown to convey the spray from the pump to the gun. The full length of hose may be used, providing it is securely tied to the pump; in which case all that is necessary to change from spraying vines to fruit trees is to remove four small bolts in each "hand."

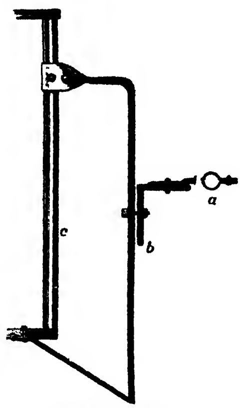


Fig. 3—Details of attachment.

In spraying vines the engine is started and the spray adjusted just before the pump enters the trellis. All that is then necessary is to drive once between each row. The man in charge walks behind to see that all is going right, and a boy can be used to drive the horse or horses. One man is thus dispensed with and the spraying done in less time. Later in the season, when the growth of the vine is greater, if one gun will not give sufficient spray to cover the whole of the vine two guns could be placed on each side, one above the other, thus giving double the covering power. This, however, would only be possible with the most powerfu types of motor spray pumps.

With a quiet horse, used to the work, a boy to drive would not be necessary.

A Plea for Farm Women.

"The man on the land may make a periodical valuation of his live stock and dead to determine his financial position. He will write off a certain amount of depreciation, but which of us can place a valuation on the best asset we have—our women folk—and who will calculate the amount of depreciation brought about by impaired health, often the result of our own thoughtlessness or indifference." There were many settlers who went on the land who, to his mind, seemed to start at the wrong end of the job, continued Mr. W. L. Davies, of Kalangadoo, in the course of a paper read at the women's session of the recent congress of the South Australian Agricultural Bureau. He knew only too well that funds would not allow them to do all that they would wish; but there were some who seemed to think that, while Dobbin must have a nice warm stable, anything would do for mother and the youngsters until they could get a start, and the start often took so long to accomplish that by the time the nice big new house was built the youngsters had scattered, and mother somehow did not seem to have much appreciation left for her altered circumstances.

Pure Seed.

Growers Recommended by the Department.

The Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops, in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon, and (2) after a sample of the seed has been received by the Under Secretary and Director, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the prices for the seeds mentioned hereunder.

Wheat :—	
Firbank	Manager, Wagga Experiment Farm, Bomen.
Hard Federation	Manager, Wagga Experiment Farm, Bomen.
	Manager, Experiment Farm, Cowra.
	Manager, Experiment Farm, Temora.
Canberra...	Manager, Wagga Experiment Farm, Bomen.
	Manager, Experiment Farm, Cowra.
	Manager, Experiment Farm, Temora.
Zealand	Manager, Wagga Experiment Farm, Bomen.
Wandilla	Manager, Wagga Experiment Farm, Bomen.
	Manager, Experiment Farm, Cowra.
	Manager, Experiment Farm, Temora.
Yandilla King	Manager, Wagga Experiment Farm, Bomen.
	Manager, Experiment Farm, Temora.
	Manager, Experiment Farm, Cowra.
Marshall's No. 3	Manager, Wagga Experiment Farm, Bomen.
Riverina...	Manager, Wagga Experiment Farm, Bomen.
Federation	Manager, Wagga Experiment Farm, Bomen.
	Manager, Experiment Farm, Temora.
Waratah...	Manager, Wagga Experiment Farm, Bomen.
	Manager, Experiment Farm, Cowra.
	Manager, Experiment Farm, Temora
Cleveland	Manager, Experiment Farm, Bathurst.
Gresley	Manager, Experiment Farm, Cowra.
	Manager, Experiment Farm, Temora.
	Manager, Experiment Farm, Condobolin.
Clarendon	Manager, Experiment Farm, Glen Innes.
Florence	Manager, Experiment Farm, Glen Innes.
Oats :—	
Algerian	Manager, Experiment Farm, Bathurst.
	Manager, Experiment Farm, Glen Innes.
	Manager, Experiment Farm, Temora.
Guyra	Manager, Experiment Farm, Glen Innes

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

A New Fruit Case.

The Minister of Agriculture directs attention to the new regulation under the Fruit Cases Act, 1912, published in the *Government Gazette* of 21st November, 1924, by which an extra quarter-bushel case 18 inches long by $5\frac{7}{8}$ inches wide by $5\frac{1}{4}$ inches deep has been added to the list of cases already prescribed under the said Act.

Poultry Notes.

JANUARY.

JAMES HADLINGTON, Poultry Expert.

AT the commencement of another year it would be well for every poultry, farmer to look back and take stock of his position relatively to previous years—then to look forward and make his plans for the next twelve months. The first may not appear an easy matter to the farmer who does not (perhaps cannot) keep account of all his transactions, the egg production of his farm &c. It is well understood how many poultry farmers, working under difficulties with indifferent or inadequate equipment, and perhaps under the necessity for improvisation at every point, find themselves so burdened with work that it is almost impossible to keep in black and white all the details they would wish to keep in connection with their business. Hence t is that only a small proportion of farmers know their actual position except n cash at any time. Admitting all this, there are a few particulars that every poultry farmer should have on record, the keeping of which will not nvolve either much time or much skill in book-keeping.

For instance, if on the 1st of January or thereabouts of each year a poultry. farmer had the following simple information before him, he would be able to summarise the profitableness or otherwise of his business:—

1. The number of adult stock carried during the year.
2. The number of chickens raised.
3. The amount paid out for feed actually used.
4. The income during the year.
5. Additions to stock or plant.
6. The number of dozens of eggs marketed.

This at first sight might appear to many to be a somewhat formidable undertaking. Perhaps it will look less so when a simple method is put forward. After all, it resolves itself into one word, "System." Take Nos. 1 and 2. In January every poultry farmer can distinguish his hens from the young stock, and all that is necessary is to count them and record the number. This may be looked upon by some as a big task, but it really is nothing of the kind. Take a farm with 1,000 layers and the young stock in course of rearing; if two persons go the right way about it, they can count them in from two to four hours, according to their disposition on the farm. No. 3 will resolve itself into a matter of adding up the feed accounts, whether booked up or only filed. No. 4 can, if in no other way, be extracted from the account sales received from selling agents. No. 5 might be actual costing, if accounts are kept, and if not, it demands only the estimated value of the buildings. No. 6 is also easily extracted from the account sales, but with the addition of the number of eggs consumed by the family or disposed

of in any other way. Such simple data will enable one to find out the weakness or strength of his position. The absence of such a summary has caused hundreds to become disheartened and to abandon poultry-farming, while others have piled up debts they would never have contracted had they been able accurately to assess their true position.

Many will be found complaining that poultry-farming does not pay, or that the return for the labour is inadequate. Admittedly it is not a business one would enter if the objective was the making of a fortune or the equal of a highly paid profession inside of a few years, but it is not as bad as it is sometimes painted. These complaints come as a rule from persons who are working up a poultry farm, having started with a small capital and often no experience, and who fail to keep even simple records or to take stock as mentioned above. The outcome of this may be indicated by a hypothetical case. A poultry-farmer starts by rearing, say, 750 to 1,000 chickens in the first season, obtaining from them 300 to 400 pullets. In the following year when these pullets become productive, the same number or perhaps a larger number of chickens is attempted with the idea of raising the laying stock to 600 or 800. In the meantime money has been spent on buildings and equipment necessary to accommodate the increasing number of stock. The would-be poultry-farmer has climbed the first hill, but he is now at the foot of the second (equal in height), which he must negotiate. It is during the climb to the second summit that one is told that poultry-farming does not pay, and it is at this stage that many a farm has been abandoned. What has happened is this: The beginner expected that when he had raised his first season's chickens his farm would be a paying concern, and most probably it was, but only on a stocktaking basis. In other words, his assets are in stock reared and in the value of the additional buildings, but the farm returns, and can only be expected to return. very little, if anything, in cash. Why? Because all the profits have gone into assets, and must of necessity do so until the second year's stock become productive. The rearing and housing of the second batch of chickens absorb the returns from the first lot, and it is only when the farm is fully stocked and equipped with the requisite number of birds, and when increase in numbers and in extension of buildings ceases that returns actually become available for the farmer himself. The same thing applies in the case of a farmer who decides to increase the number of birds on the farm; every increase of 100 birds means a reduction in the cash return by reason of the increased cost of feeding and housing the young birds until they become profitable. In both cases, but especially in the first, the farmer is apt to forget that he is accumulating value even if he is not getting the cash.

Overhaul the Brooder Plant.

The rearing season might appear to be a long way off in January, but in reality it is not so far away, and it is not too soon to put in hand any alteration that may be necessary. During this last season many thousands of chickens have been sacrificed by faulty brooding, the result, in many cases, of errors

in construction of the brooding plant. Often the system in use has been condemned by the farmer, while in others, the owners, not knowing that their brooder installations were put in wrong, have carried on under difficulties, quite unaware of the real cause of their trouble. If poultry-farmers would cast off the everlasting fear of chicken diseases and put their brooding plants in order, they would escape many of their troubles and the greater part of their losses in rearing.

During the last rearing season a large number of cases of faulty brooding were attended to by officers of this Department, and some of the difficulties were overcome right away, while others involved alterations that would mean suspension of brooding operations to put them right, which, of course, could not be thought of in the middle of the rearing season.

Observations over a large number of farms go to show that more than half of the brooding plants in use are faulty in construction. In some cases very little alteration would be necessary to put them right. Many a brooding system is doomed to be scrapped or to be altered in such a way as to cause further trouble, though they would be quite efficient if only put right. In hot water circulating systems, for instance, the level of the pipes, the height from the floor, the height of the tank above the heater, the size of the expansion pipe, &c., all have their bearing on the work of the plant. If a brooder cannot be kept at 90 degreees or over in cold weather, and while empty of chickens, there is something wrong. Now is the time, while brooding operations are suspended, to have these matters attended to. The services of a plumber may or may not be required, but it should be remembered that a plumber is not always conversant with requirements, and it will be best first to seek advice. The Department will do all that is possible to assist poultry-farmers with advice to enable them to overcome these difficulties. All that is necessary is to make application to the Under Secretary for a visit, and an inspection will be made gratis.

Milk for Chickens.

From time to time reference has been made in these notes to the use of milk in the food of chickens. The one drawback to its use on every farm has been the fact that poultry-farming areas are for the most part too small to admit of keeping the necessary cows to furnish the milk, nor are these farms, generally speaking, in localities where skim milk is obtainable. However, it is anticipated that a skim milk powder will become available shortly, and in view of this experiments have been carried out at Hawkesbury Agricultural College to determine, (*a*) the comparative value of the skim milk powder used in this experiment as against ordinary skim milk from the College dairy; and (*b*) the value of each in comparison with water for mixing the mash.

Two series, each of three lots of 100 chickens, were used, each lot being of the same hatch, with a view to ensuring uniformity throughout the whole series.

Experiment in Series I was commenced on 2nd August, terminating on 25th October.

Experiment in Series II was commenced on 10th September, terminating on 3rd December.

In each series Lot 1 was fed on the College ration for chickens—the mash being mixed with skim milk from the dairy.

Lot 2 was similarly fed—the mash being mixed with the skim milk powder mentioned, dissolved in water ($4\frac{1}{2}$ oz. to each quart water).

Lot 3 was similarly fed—the mash being mixed with water alone.

The following table summarises the results:—

		Average Weight per Chicken.		
		Four Weeks.	Six Weeks.	Twelve Weeks.
		oz.	oz.	oz.
Lot 1.	Skim milk	4·35	7·80	23·34
	Skim milk powder	4·39	8·22	24·11
	Water	4·38	6·28	19·43
Lot 2.	Skim milk	4·72	9·32	21·98
	Skim milk powder	4·73	8·89	20·65
	Water	4·1	7·80	18·70

The total weight of 161 chicks at 12 weeks old, fed on skim milk powder, was 225 lb. 5 oz. = 140 lb. per 100 chicks, while the total weight of 149 chicks at 12 weeks old on water was 177 lb. 7 oz. = 119 lb. per 100 chicks.

The gain in weight was therefore 21 lb. per 100 chicks. It will be seen that the average weight per chicken was as near as possible the same in Lots 1 and 2 in each series. Approximately 48 lb. of skim milk powder were used for the experiment. This is equivalent to about 30 lb. skim milk powder per 100 birds.

On the question of development, it might be noted that the last lot in the experiment is of less weight in each case. This might be expected, owing to the fact that they were hatched later in the season.

In Support of Co-operative Fruit Packing.

"Orchardists generally give most of their attention . . . to their orchards, looking upon the selling of their products as the business of the agent, auctioneer, and storekeeper. They conscientiously attend to cultivation, pruning, spraying, &c., yet leave a vital branch of the industry to outsiders, whose interests are naturally to make as much as possible ou of selling. . . . Imagine (if possible) a manufacturer, who has prepared his product for market, handing it over to agents to sell at what price they (the agents) chose to accept! A sales department is created and the article is pushed on to the market. This is where the packing company creates the necessary machinery to market the product of its members."—Mr. C. V. Henry, Manager of Batlow Packing Shed, in a recent Bureau address.

Orchard Notes.

January.

W. J. ALLEN and W. LE GAY BRERETON.

MUCH wet weather occurred towards the close of last year in many of the fruit districts, causing damage to the cherry crops and starting fungous diseases, such as black spot in apples and grapes, and brown rot in stone fruits. It is after such periods that growers are liable to neglect conservation of soil moisture, but they should remember that it cannot be foretold how the season will turn. Cultivation should, therefore, be attended to not only to ensure moisture for the later ripening fruits, but to enable the trees to mature good strong fruiting buds for the following season.

Summer Training.

No one period can be set down for this work, as young trees in which the main framework is being developed require looking over periodically throughout their growing period. Often, during the growth that trees put on just about this time, certain leaders of a tree will rush ahead of their neighbours; such leaders should be pinched back to try to keep an even growth in all the leaders.

The shortening back of the current year's laterals of the Rome Beauty apple or other varieties of similar habit, in order to hasten fruit-spur formation, can be carried out towards the end of the month or early in February. The idea is to strike a time as nearly as possible which will only allow a short growth to form after the cutting before growth ceases in the autumn.

A watch should still be kept on all buds or grafts that started into growth last spring, in order to prevent any strong growth from the stock robbing them, and also to provide ties where necessary to prevent them being damaged by wind. When the growth from buds or grafts is very rapid it is sometimes necessary to top them back so as to prevent their being blown out by the wind.

The rains at the end of the year should have caused the sap to run freely in all stock, and have made them very suitable for budding during the present month. Wood for this work should only be selected from trees that have proved reliable croppers of a good type of the variety required. Though the results from selection have been more definitely favourable in citrus than in deciduous trees, no chances should be taken when working the latter class of fruit trees. It is recommended that those who have not done so should read the article entitled "A Successful Citrus Orchard" in the October issue of the *Agricultural Gazette*, in which are mentioned specific cases of beneficial results from stock and bud selection as far as citrus is concerned.

Drying.

The fruit drying season generally starts with apricots in the inland districts at the end of December, continuing into January. Peaches follow towards the end of January or early in February, and the season finishes with prunes and the raisin grapes. Those who intend to carry out this work, and are new to it, should procure *Farmers' Bulletin* 52, "Fruit Drying;" price 10d., post free. A free leaflet dealing with the drying of prunes currants, sultanas, and raisins is also available.

Pests and Diseases.

Cover sprays of lead arsenate for codlin moth should be continued on all apples and pears except varieties that are picked within the next two or three weeks. Care should be taken regularly to collect and destroy by boiling all fruit infected with this, or other fruit-eating pests.

All second-hand cases or returned cans coming to the orchard should be plunged for 3 minutes under boiling water immediately on arrival.

Where woolly aphis is reappearing on apple trees an attempt should be made to have them sprayed with tobacco wash, or one of the commercial nicotine sprays, before the busiest part of the picking season starts. Tobacco wash or nicotine extracts that contain no foreign matter liable to upset the lead arsenate may be combined with the lead arsenate spray. The only trouble about such a combination is that for woolly aphis it should be applied as a drenching spray, which requires a greater quantity than where a spray is being applied merely as a cover spray.

If white wax scale on citrus trees breeds out early, and the trees are free from other scale such as red scale and white louse, they should be sprayed with soda wash ($1\frac{1}{2}$ lb. washing soda to 4 gallons water) before the earliest of the young insects are bigger than a pin's head. If red scale or white louse are also present it would be better not to use the soda spray, but to fumigate a little later, say from February to March. White louse can be dealt with by applying a strong lime sulphur spray while the louse is still confined to the main scaffold limbs; once the pest has spread to the small growth carrying the foliage, fumigation is the only satisfactory method of coping with it.

Red scale can be kept in check to some extent with resin soda spray, but by far the most thorough way of dealing with it is fumigation. It is usual, when trees have been thoroughly cleaned of red scale by fumigation, for the operation not to need to be repeated for two years, and sometimes they will even run for three years without need of repetition. Leaflets are obtainable on fumigation, resin soda spray, white wax, and white louse on application to the Under Secretary and Director.

As a rule, cows which are big feeders are less difficult to feed and care for than those of smaller capacity. They are more than likely to be more profitable producers, as they are less dainty in their tastes and will consume a greater proportion of the more plentiful and coarser roughage.—"Dairying in Kansas."

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alterations of dates should be notified at once.

1925.

Society.	Secretary.		Date.
Albion Park A. and H. Association	H. R. Hobart	Jan.	9, 10
Dapto A. and H. Society	E. G. Coghlan	,,	16, 17
Northern Suburbs A. & H. Association (St. Ives)	F. Conway	,,	16, 17
Gosford A. and H. Association	H. G. Parry	,,	23, 24
Kiama A. Society	G. A. Somerville	,,	24, 26
Wollongong A. H. and I. Association	W. J. Cochrane	,,	29, 30, 31
Berry P. and A. Association	....	Feb.	6, 7
Yanco Irrigation Area A. Society (Leeton)	W. Roseworn	,,	10, 11
Moruya A. and P. Society	H. P. Jeffery	,,	10, 11
Nowra P. and A. Association	....	,,	12, 13, 14
Central Cumberland A. & H. Association (Castle Hill)	H. A. Best	,,	13, 14
Tahmoor and Couridjah A. H. and I. Society	E. S. Key	,,	13, 14
Queanbeyan P. and A. Association	....	,,	17, 18
Guyra P. and A. Association	P. N. Stevenson	,,	17, 18, 19
Pambula A. H. and P. Society	L. K. Longhurst	,,	18, 19
Milton A. and H. Association	F. W. Cork	,,	18, 19
Alstonville Agricultural Society	W. J. Dunnet	,,	18, 19
Tilba A.P. and H. Society	R. L. Hapgood	,,	18, 19
Hannamvale A. Society	W. H. Buttsworth	,,	20, 21
Kangaroo Valley P. and A. Association	....	,,	20, 21
Luddenham P. and A. Society	....	,,	20, 21
Nimmitabel A. and P. Association	R. K. Draper	,,	24, 25
Uralla P. and A. Association	D. T. McLennan	,,	24, 25, 26
Gunning P. and A. Association	....	,,	25, 26
Mullumbimby P. and A. Association	....	,,	25, 26
Warialda P. and A. Association	....	,,	25, 26
Adaminaby A. Society	P. L. Crisp	,,	26, 27
Newcastle A. H. and I. Association	E. J. Dann	,,	24 to 28
Blacktown A. Society	J. McMurtrie	,,	27, 28
Robertson A. & H. Association	A. E. Myers	,,	27, 28
Bega A. P. and H. Society	H. J. B. Grime	Mar.	3, 4
Braidwood P. and A. Association (Jubilee Show)	R. L. Irwin	,,	3, 4, 5
Inverell P. and A. Association	....	,,	3, 4, 5
Yass P. and A. Association	E. A. Hickey	,,	4, 5
Tumut A. and P. Association	T. E. Wilkinson	,,	4, 5
Bangalow P. and A. Society	....	,,	4, 5
Manning River A. and H. Association (Taree)	R. Plummer	,,	4, 5, 6
Oberon A. H. and P. Association	S. Marsden	,,	5, 6
Berrima A. H. and I. Society (Moss Vale)	W. Holt	,,	5, 6, 7
Walcha P. and A. Association	A. D. Murchie	,,	10, 11
Tumbarumba and Upper Murray P. and A. Society	R. W. Stewart	,,	10, 11
Mudgee A. P. H. and I. Association	R. Shaw	,,	10, 11, 12
Cobargo A. P. and H. Society	T. Kennelly	,,	11, 12
Narrabri P. A. and H. Association	V. W. Jones	,,	11, 12
Coraki P. and A. Society	....	,,	11, 12
Bombala P. and A. Association	....	,,	11, 12

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Wauchope P. and A. Association	....	,, 12, 13
Hunter River A. and H. Society (West Maitland) ...	J. S. Hoskins ...	,, 11,12,13,14
Bellinger River A. Association (Bellingen)	J. F. Reynolds ...	,, 12, 13, 14
Campbelltown A. Society	W. N. Rudd ...	,, 13, 14
Batlow A. Society...	C. J. Gregory ...	,, 17, 18
Cumnock P. A. and H. Association	K. J. Abernethy...	,, 18
Bowraville A. Association	L. Waters ...	,, 18, 19
Nimbin P. and A. Society	....	,, 18, 19
Dungog A. and H. Association	W. H. Green ...	,, 18, 19, 20
Crookwell A. P. and H. Society	C. H. Levy ...	,, 19, 20
Nepean A. H. and I. Society (Penrith)	C. H. Fulton ...	,, 20, 21
Rydal A. H. and P. Society	S. Bruce Prior ...	,, 20, 21
Blayney A. and P. Association	H. R. Woolley ...	,, 24, 25
Dorrigo and Guy Fawkes A. Association (Dorrigo) .	A. C. Newman ...	,, 24, 25
Cooma P. and A. Association	C. J. Walmsley ...	,, 25, 26
Goulburn A. P. and H. Society	F. D. Hay ...	,, 26, 27, 28
Camden A. H. & I. Society	G. V. Sidman ...	,, 26, 27, 28
Cessnock A. Association...	Bill Brown ...	,, 27, 28
Upper Hunter P. and A Association (Muswellbrook)	R. C. Sawkins ...	April 1, 2, 3
Macleay A. H. and I. Association (Kempsey) ...	N. W. Cameron ...	,, 1, 2, 3
Stroud P. and A. Association	....	,, 3, 4
Royal Agricultural Society of N.S.W.	G. C. Somerville .	,, 6 to 15
Liverpool P. and A. Association	....	,, 17, 18
Gloucester A. H. and P. Association	F. S. Chester ...	,, 22, 23
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Bathurst P. and A. Association	....	,, 22, 23, 24
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Upper Manning A. and H. Association (Wingham) ..	D. Stewart ...	,, 29, 30
Wingham ———	....	,, 29, 30
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Cootamundra A. P. H. and I. Association	W. W. Brunton...	,, 1, 2
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Cowra P. A. and H. Association	E. D. Todhunter...	,, 15, 16
Holbrook P. and A. Society	J. S. Stewart ...	,, 15, 16
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Temora P. A. H. and I. Association	A. D. Ness ...	,, 22, 23, 24
Canowindra P. A. and H. Association	J. T. Rue... ...	,, 22, 23
Murrumburrah P. A. and I. Association	W. Worner ..	,, 29, 30
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Championship Field Wheat Competitions.

THE JUDGES' REPORTS.

DEVELOPING its programme of previous years, the Royal Agricultural Society in 1924 arranged Championship Field Wheat Competitions in three divisions of the State—one for the Riverina and South-west, a second for the Central West, and a third for the North-west. With the approval of the Hon. F. A. Chaffey, H.D.A., M.L.A., Minister for Agriculture, the judging in the first two divisions was done by Mr. H. C. Stening, manager of Temora Experiment Farm, and in the third by Mr. G. C. Sparks, manager of Glen Innes Experiment Farm. The following extracts from the reports furnished by the judges to the President and Council of the Royal Agricultural Society will interest all wheat growers :—

THE CENTRAL WEST DIVISION.

H. C. STENING, H.D.A., Manager, Temora Experiment Farm.

There were nine societies entered for championship honours, viz., Bogan Gate, Dubbo, Forbes, Gilgandra, Narromine, Parkes, Peak Hill, Trundle, and Wellington. Judging commenced on 24th November at Gilgandra, and was completed on the 28th of the same month at Parkes.

After a series of unfavourable seasons, this division of the State has this season received a rainfall above the average during the wheat-growing period, April to October. As a result there is great promise of a very satisfactory average wheat yield over the whole division, and where up-to-date farming methods have been practised, some very high individual yields are anticipated. According to the records of the Central Weather Bureau, the effective rainfall during the period April to October was from 11·70 inches at Trundle to 15·65 inches at Parkes, representing 1·13 and 3·28 inches respectively above the average for the period. The rains during the seeding period, April and May, were from 3 points to 3·37 inches below average; the winter rains during June and July were in the vicinity of the average, while the spring rains were from 1·38 to 2·87 inches above average. The precipitation during the month of November was much in excess of the average for this month, varying from 3·11 inches at the most southern district (Forbes), to 7·92 inches at the most northern district (Gilgandra). The latter rains, accompanied by high winds, were responsible for the lodging and tangling of a number of heavy crops, but it is anticipated that the benefit derived in increasing the yield will outweigh the losses due to damaged crops.

Details of the points awarded in the judging and the particulars of the cultural treatment of the crops are set out in the appended table. The rainfalls given cover in each case the period April to October, inclusive.

Details of Awards.

Local Society.	Name and Address of Competitor.	Variety.	Methods of Cultivation.	When Sown.	Quantity of Seed per acre.	Quantity of Superphosphate per acre.	Effective Rainfall.	Number of Crops grown previously.	Points Awarded. Apparent Yield. (One point for every bushel.)	Trueness to Type. Max. 20 points.	Freedom from Disease. Max. 20 pts.	Evenness. Max. 20 points.	*Cleanliness. Max. 30 points.	†Condition and Appearance. Max. 28 points.	Total Points.
1. Peak Hill ...	R. Webb, "Moira," Tomingley.	Turvey ...	Fallowed 4½ inches deep, June and July; harrowed August, springtoothed end September and January; sown with combine.	Mid April.	lb. 50	lb. 45	inches. ...	6th	40	18½	19	19	‡ 29 (29)	‡ 24 (26)	149½
2. Parkes ...	R. M. Kelly, "Wirrocara," Parkes.	Turvey ...	Fallowed 3 inches July; harrowed August; springtoothed September, harrowed December and February; sown with combine; harrowed two days after sowing.	5 May	60	70 (high grade.)	12·25	Over 6	41	17	17	19	29 (30)	25 (28)	148
3. Forbes ...	H. E. Elliott, "Kelvin Grove," Forbes.	Waratah ...	Fallowed 3 inches to 4 inches September and October; harrowed December and January; disced March.	Last week April.	60	75	..	1st crop.	40	19½	20	19	24 (24)	23 (24)	145½
4. Trundle ...	Mailer Bros., "Trundle Park," Trundle.	Canberra, 20 acres; Hamel, 20 acres; Clarendon, 10 acres.	Fallowed 4 inches August; springtoothed September and October; harrowed April; disced May; crop harrowed last week June.	18 to 21 May.	57 to 60	70	...	Over 6	33	19	18	19	28 (30)	26 (28)	143
5. Gilgandra ..	Beveridge Bros., "Tuglands," Gilgandra	Yandilla King ...	Summer fallowed April, with disc plough and cultivator; ploughed September and again before sowing.	May ...	40	60	11·76	13	33	15	19½	19	29 (30)	27 (28)	142½
6. Wellington ...	Quirk and Everett, "Narrawa," Wellington.	Gresley ...	Fallowed 4 inches mid-July; springtoothed and harrowed early September; disced early February; harrowed early March and end April; harrowed after sowing.	19 and 20 May.	56	Nil.	13·61	23	36	18	16	18	28 (30)	26 (28)	142
7. Bogan Gate ...	Dwyer Bros., "Alverna," Bogan Gate.	Canberra ...	Summer fallowed with springtooth February; ploughed early September; harrowed February; springtoothed May.	25 May	43	40	13·50	Over 6	30	19½	17	19	27 (30)	26 (28)	138½
8. Narromine ...	D. C. Mitchell, "Maybrook," Narromine.	Canberra ...	Fallowed 4½ inches July and August; harrowed September; scarified October, December and February; harrowed May.	1st week May.	45	62	...	4th crop	34	19½	19	19	26½ (27)	18 (25)	136
9. Dubbo ...	F. W. Brownlow, "Llambaddon," Dubbo.	Waratah ...	Fallowed August; springtoothed September, February and April; sown with combine.	1st week June	60	45	..	very old land.	28	19	18	17	24 (30)	26 (28)	132

* First crop, 24 points; second, 25; third, 26; fourth, 27; fifth, 28; sixth, 29; over six crops, 30 points. † First or second crop, 24 points; third and fourth, 25; fifth and sixth, 26; over six crops, 28 points. ‡ In parentheses are shown the maximum in each case.

The Leading Crops.

The championship was won by a very well headed and dense crop of Turvey, estimated to yield an average of 40 bushels per acre. It was very free from weed-growth, gaining maximum points for cleanliness, and it lost only one point for disease owing to the presence of a little loose smut. The purity of the crop was marred by a very small sprinkling of "foreigners." The heavy growth was rather tangled, but no very great difficulty would be experienced in recovering the whole of the grain with a header. The crop was the sixth grown on the particular block of land, and therefore carried a penalty of one point for cleanliness and two points for condition in comparsion with land cropped for longer periods.

Mr. Webb's success can largely be attributed to the intelligent methods of cultivation he has adopted in the preparation of the land, which was ploughed 4½ inches deep in June and July, 1923, harrowed in August, cultivated with the springtooth cultivator at the end of September and again in January, 1924, and was sown with the combine in mid-April with 50 lb. graded seed per acre, treated with bluestone solution, and fertilised with 45 lb. superphosphate per acre.

The second prize crop was also of the Turvey variety, which was estimated to yield 41 bushels per acre, or one bushel more per acre than the champion crop, but it suffered loss of points owing to the presence of "strangers" and of the fungous diseases flag-smut, loose-smut, and a very slight trace of bunt.

For this crop the preparation of the fallow was somewhat similar to that for the champion crop, with the exception that the ploughing was more shallow. Graded seed treated with dry copper carbonate was sown with the combine on 5th May at the rate of 60 lb. seed, and manured with 70 lb high grade superphosphate per acre.

The third prize crop at Forbes was a high yielding crop of Waratah, which gained maximum points for freedom from weeds and diseases and was very pure and even, but owing to being grown on new ground, was obliged to concede a handicap of 10 points to crops grown on old land. For this crop, the initial breaking of the fallow was later, being performed in September and October with a disc-cultivator.

Methods of Cultivation.

The whole of the nine crops eligible for competition for the championship were grown on fallowed land, and the treatment of the fallow in every case may be adjudged high class. The initial breaking of the fallow was performed sufficiently early for the storage of the winter rains, and in two cases the land was fallowed in the autumn, thus extending the fallow period and putting the soil in a condition to absorb the autumn and early winter rains. All of the fallows were cultivated in early spring, thus checking loss of stored moisture before the advent of rapid evaporating agencies, and moreover the general treatment of the fallows was conducive to the preparation of ideal seed beds.

During the tour through these districts, a marked general improvement was noted to have taken place in farming methods; doubtless the lesson that fallowing is the sheet-anchor of success in wheat growing has been learnt in the hard school of adversity, in the form of a sequence of seasons of under-average rainfall.

Summarising seeding operations, the times of sowing were from mid-April to the first week in June, and the rate of seeding from 40 to 60 lb. per acre. No hard and fast standard can be made as to the correct quantity of seed that should be sown, for the rate of seeding should be influenced by such factors as time of sowing, size of seed, and stooling capacity of variety. Experiments indicate that under average conditions 45 to 60 lb. is the most satisfactory range. Only in one instance, viz., at Wellington, was the crop sown without fertiliser, and the applications of superphosphate varied from 40 lb. low grade fertiliser to 70 lb. high grade. The latter quantity, which is equivalent in soluble phosphate to 85 lb. low grade fertiliser, was applied to the crop estimated to return the highest yield. Wheat growers would, however, be ill-advised to accept the experience of one season as a basis for their future operations, especially as the results of experiments conducted over a number of years are opposed to such large applications of superphosphate in the western districts.

Varieties.

The most successful variety was Turvey, which secured both first and second prizes. Under favourable conditions this variety is a heavy yielder of grain and hay, but under similar conditions it is doubtful if it is the equal of Yandilla King.

Other varieties to give a good account of themselves were Waratah, Canberra, and Gresley. The first named is shaping well as a rival to Canberra as an early maturing wheat; it is stronger in the straw, and therefore stands up better under rough weather conditions; it appears, moreover, to be less susceptible to disease. Gresley has given evidence of being a useful dual-purpose variety for the west.

Diseases.

Most crops were slightly infected with "red rust," but it was evident that the attack occurred too late to cause any material damage. Flag smut was fairly prevalent, especially in the crops of Canberra and Turvey. There was a little take-all and loose smut in some crops, and a slight infection of bunt was detected in two crops; for one of these crops the seed had been treated with bluestone solution and for the other with copper carbonate powder. In the latter case there was only a very slight trace of the disease present. Of the nine crops inspected, the seed had been treated with bluestone solution in four instances, with dry copper carbonate in three instances, with formalin solution in one, and one crop was sown without treatment of the seed. The germination appeared to have been satisfactory in every case, and evidently the soil conditions at the time of seeding were congenial to a good

germination. This is an important factor in the reduction of such fungous diseases as bunt and flag-smut, which gain entrance to the plant at the early seedling stage between the time the "plumule" or young stem emerges from the grain and the appearance of the first green shoot. It follows that the shorter this period, the less risk there is of infection.

In conclusion, it is pleasing to be able to report a very successful wheat season in the middle Western Division, largely due to the great advance that has been made in farming methods. This advance can be attributed in no small measure to the lessons taught by means of crop competitions, in which considerable interest and enthusiasm has been stimulated by the championships awarded by the Society.

THE RIVERINA.

H. C. STENING, H.D.A., Manager, Temora Experiment Farm.

The societies which conducted local competitions in the Riverina division were Barellan, Berrigan, Coolamon, Corowa, Finley, Ganmain, Henty, Lockhart, Narrandera, Oaklands, Wagga Wagga, and Yanco. Owing to the winning crop of the Barellan competition being badly damaged by storms, the entry was withdrawn, leaving eleven crops to be judged. The judging commenced at Leeton on 1st December, and was completed at Henty on the 5th.

The division of the State covered by this competition enjoyed a bountiful season, the total rainfall for the wheat-growing period being in the vicinity of the average, varying from 10·96 inches at Berrigan to 14·18 inches at Henty. The seeding rains during April and May bordered on the normal, being from 14 points below average at Berrigan to 74 points above average at Henty, resulting in ideal conditions for germination. The winter rains, June and July, were below the average, from 1 point at Narrandera to 170 points at Henty. During this period in most districts there was an absence of rain for over a month, with continuous severe frosts, and the prospects for a satisfactory harvest were then anything but bright, but good rains fell in the latter part of July, and were succeeded by splended rains a little above normal during the spring months, August to October. These rains, assisted by good falls early in November and accompanied by mild temperatures, assured a bumper harvest, and it will not be surprising if a record average yield is reached in this division.

The points awarded to each of the competitors are set out in tabulated form according to the scale of points adopted by the Society.

Accurate records of the rainfall were not procurable at any of the farms of the competitors. It would be to the advantage of all farmers to provide themselves with a rain-gauge and carefully to keep records of the rainfalls, which would furnish valuable data for their own information and guidance.

There is frequently such a large variation in rainfall registrations within three or four miles that the records at the nearest post office do not accurately represent the facts for a farm some miles distant.

The championship was won by a dense, well-headed, and even crop of the Turvey variety, estimated to yield 41 bushels per acre, and scrupulously free from weeds. There was a small reduction of points owing to the presence of "strangers," and a slight infection of flag-smut, take-all, and loose smut. For this crop the land was fallowed 4 inches deep in September, one-half with the mouldboard plough and one-half with the disc plough; but no difference could be noted in the growth of the crop as the result of the work performed by the two types of plough. The fallow was harrowed twice in October, scarified in February, cultivated with the springtooth cultivator in March, scarified in May, and harrowed before and after sowing. Sowing was carried out in mid-May with 60 lb. per acre graded seed, which had been treated with copper carbonate; the crop was manured with 60 lb super-phosphate per acre.

The second-prize crop consisted of 40 acres of Bomen and 10 acres of Turvey. It was rather unfortunate that the whole of Mr. Knight's crop was not of the Bomen variety, in which case it would have won the championship with a total of 155 points. It was remarkably true to type, even, and estimated to yield thirteen bags per acre, and it was in excellent harvesting condition. It was, moreover, extremely free from weeds and diseases, which was all the more creditable in view of the fact that the land had been under cultivation for forty-one years, and had grown about thirty crops previously. The Turvey crop suffered loss of points for yield, freedom from disease, and condition of crop on account of a late attack of take-all and the presence of red rust; in purity the crop suffered by the presence of "strangers."

Mr. Knight is a firm believer in deep ploughing, and he fallowed his land 6 inches deep with the mouldboard plough in August. The fallow was harrowed and cultivated with the springtooth cultivator in October, skim-ploughed in February, and sown at the end of May with 60 lb. per acre of graded seed, which had been treated with bluestone solution. The quantity of fertiliser applied was 56 lb. high-grade superphosphate, which is equivalent in soluble phosphate to 68 lb. low-grade superphosphate.

Three varieties were included in the third-prize crop, viz., 20 acres Waratah and 15 acres each of Riverina and Aussie. Here again, if the owner had had a full 50 acres of Waratah crop of the same standard as his 20 acres he would have secured the championship, for it was a very dense, pure, even-headed crop, estimated to yield 43 bushels per acre. The crops of Riverina and Aussie were judged not to be so high yielding, and contained a sprinkling of Waratah heads through them. The whole 50 acres of crop was very even and free from disease; there were a few "black oats" which did not appear above the crop, but considering that the land had been under cultivation for over thirty years, the cleanliness of the crop was very satisfactory. The fallow was ploughed 4 inches deep with the mouldboard

plough in August, cultivated eight times, being harrowed in September, scarified in October, harrowed in November, part skim-ploughed and part disced in March, harrowed and scarified in April, harrowed and skim-ploughed before sowing. It was sown at the end of May with 80 lb. graded seed, treated with dry copper carbonate, and manured with 100 lb. to 112 lb. per acre high-grade superphosphate, which contains the same quantity of soluble phosphate as 122 lb. to 137 lb. low-grade superphosphate.

Methods of Cultivation.

The table giving particulars of the methods of cultivation adopted in the production of the crops judged in the competition shows that the treatment of the fallows by the best farmers in the Riverina has reached a very high standard. The crop which was placed fourth received no fewer than thirteen preparatory cultivations, while the third-prize crop received nine and the champion crop eight cultivations.

No hard-and-fast rules can be laid down as to how often a fallow should be cultivated, the number of times being regulated by the nature of the soil, the rainfall, the climatic conditions, and the weed growth. There is nothing to be gained by the cultivation of a fallow unless for the definite purpose of renewing the soil mulch after heavy rains, and for the destruction of weed growth. A large proportion of the soils in Riverina can be "over-worked." They become too fine under frequent cultivations, and as a result run together and set hard after heavy rain. While a finely divided and firmly compacted sub-surface soil should be aimed at, there should be maintained a loose and dry-surface mulch, not too fine, but consisting of small clods. Such a mulch does not so easily become consolidated, and remains effective longer than a dust mulch.

What is more important than the number of times a fallow is cultivated is that the cultivations shall be carried out at the proper times. The idea is that the fallow should be cultivated after every heavy rain, but as this is not possible, the cultivation should include at least one in the early spring and one before entering on harvesting operations, when a 3-inch mulch should be prepared. Cultivations preparatory to sowing should be regulated if possible to about 2 inches in depth.

There is a diversity of opinion as to the best depth for ploughing. This is dependent upon the rainfall of the district and the nature and depth of the soil. What would be the most satisfactory depth to plough in one of the more favoured districts would be regarded as too deep in a drier district where the rainfall would probably be inadequate to render the soil sufficiently compacted for best conditions for germination and growth.

Sowings were carried out from mid-April to the end of May at the rate of 56 lb. to 80 lb. per acre. A rate of sowing in the neighbourhood of a bushel was favoured by most of the competitors, but the growers of the crops placed third and fourth pin their faiths to the high rate of 80 lb. per

acre. Mr. Frazer adopts this high rate with the definite aim of discouraging stooling, in order to avoid the low unproductive ears in a crop from late-stooled stems. Such high rates of seeding are, however, opposed to the results of experiments conducted throughout Riverina over a number of years, which favour a rate of seeding from 50 lb. to 60 lb. per acre. In a general sense, higher rates have been productive of profitable increases in yield only in the case of very late sowing, when the germination for some reason has been faulty, or when the crop has been thinned by an infection of flag-smut.

The efficacy of applications of superphosphate is well understood by Riverina farmers, and it is noted that the lowest quantity applied to the competition crops was 50 lb. per acre low-grade superphosphate, and the highest quantity 112 lb. high-grade superphosphate, containing the same quantity of soluble phosphate as 137 lb. low-grade superphosphate. The wisdom of such heavy applications of superphosphate as a general practice in Riverina is to be doubted in view of the results of numerous fertiliser experiments under average conditions in this division.

There is a tendency on the part of some progressive farmers to adopt the high rates of seed and fertiliser that have been so successful in the Wimmera districts of Victoria. It must be borne in mind, however, that there the sowings are made very late in June and July, which, as the result of experience, cannot be recommended in Riverina. The increased rates of seeding and manuring are necessary to compensate for the lack of stooling of such late-sown crops, and to hasten the maturity of the crop over the shorter growing period.

Varieties.

Five crops of the Turvey variety were inspected, including the champion crop, and judging by the number of crops of this variety seen during the tour it is evident that Turvey has established itself as a favourite with Riverina farmers. The last two seasons have been especially favourable for this variety. In average seasons Yandilla King is to be preferred, especially as it is less susceptible to disease.

Bomen was the variety which formed 40 acres of the second-prize crop, the balance of 10 acres being Turvey. In previous competitions the disease-resisting capacity of Bomen has been noted, and the claim of this variety as a disease-resister is strengthened in this composite exhibit. The crop of Turvey was infected with take-all, red rust, and flag smut; while the Bomen crop alongside, sown under similar conditions, was practically free from these diseases. Unfortunately, the variety possesses red grain, which condemns it to disfavour as a wheat for export. A new Bomen crossbred possessing white grain is now in the experimental stages, and provided it retains the good qualities of its parent it should prove a very valuable variety for the more favoured portions of our wheat areas.

For highest yielding capacity, the palm can be given to the 20 acres of Waratah which formed portion of the third-prize exhibit, grown on very old land. Just as high a yield was estimated from the crop of Federation which occupied fifth place in the competition, but this crop was grown on new land.

Diseases.

Red rust was present throughout the crops, more especially in Federation and Turvey. Following on previous wet weather, rains totalling over 2 inches fell during three days in the first week in November, succeeded by still, hot muggy weather, which encouraged an alarming development of the rust in twenty-four hours. Had these conditions continued a material check in the development of the crops must have resulted: but, fortunately, a strong wind dissipated the moisture-laden atmosphere so favourable to the development of the fungus, and thus removed the danger of much damage.

The infection of crops of Federation appeared to be of sufficient severity to militate against the production of high yields by this variety in comparison with less susceptible varieties. Bunt was detected in three of the crops inspected, each of which had been pickled with bluestone solution. Unless care is taken when treating seed with bluestone to ensure that every part of every grain is wetted with the solution of correct strength there will be the risk of infection of the crops, and if bunt balls are present in the seed there is risk of reinfection of the seed.

The substitution of the dry copper carbonate method of treating the seed has reduced these risks to a minimum, and in addition the germination capacity of the seed is not impaired, as is frequently the case with bluestone and formalin solutions. It appears significant that the first and third prize crops were treated with dry copper carbonate. The crop placed fourth was treated with a proprietary mixture, and the balance with bluestone solution.

Loose smut, which was more prevalent this year than usual, cannot be controlled by the methods for the treatment of seed as prescribed for bunt, as the infection is internal. The only efficient means of checking a recurrence is the hot water treatment, which is too slow and cumbersome for ordinary farm practice. As a rule this fungus is, fortunately, not responsible for a very material reduction of yield.

Flag smut was present in some of the crops, especially those of Federation, Turvey, and Canberra varieties, and also a few crops would suffer a small reduction of yield by reason of a late attack of take-all. A good stubble burn, spelling the land from wheat for at least two years by growing oats and fallowing, and an avoidance of working the land while in a dry condition, are the most effective measures for the control of these diseases.

In conclusion, there can be no doubt that the crop competitions have proved a strong educational factor, and their influence is reflected in the more general adoption of up-to-date methods throughout Riverina.

By the universal practice of farming methods of the standard adopted by the best farmers in Riverina the wheat-growing industry will be placed on a safer and more profitable basis.

DETAILS of Awards.

Local Society.	Name and Address of Competitor.	Variety.	Methods of Cultivation.	When sown.	Quantity of Seed per acre.	Quantity of Superphosphate per acre.	Number of Crops grown previously.	Points Awarded. Apparent Yield. One point for every bushel.	Trueness to Type. Max. 20 points.	Freedom from Disease. Max. 20 points.	Evenness. Max. 20 points.	*Cleanliness. Max. 30 points.	†Condition and Appearance. Max. 28 points.	Total Points.
1. Lockhart ...	P. Rees, "Linlithgow," Lockhart.	Turvey	Fallowed 4 inches deep September, harrowed twice October, scarified February, springtoothed March; scarified May; harrowed before and after drill.	Mid May.	lb. 60	lb. 60	9th crop.	41	18	18½	19	‡ 30 (30)	‡ 26 (28)	152½
2. Corowa .	F. W. Knight and Sons, "Bolinda Glen," Corowa.	Bomen, 40 acres; Turvey, 10 acres.	Fallowed 6 inches deep August; harrowed and springtoothed October; skim-ploughed February.	End May.	60	56	Very old land.	38	19½	19	19	29½ (30)	27 (28)	152
3. Wagga Wagga ...	Thos. Fraser, "Aberfeldy," Dhulura.	Waratah, 20 acres; Riverina, 15 acres; Aussie, 15 acres.	Fallowed 4 inches August; harrowed September; scarified October; harrowed November; skim-ploughed and disced March; harrowed and scarified April; harrowed and skim-ploughed before sowing.	End May.	80	100 to 112 high grade.	Very old land.	39	19	19½	19½	28 (30)	26 (28)	151
4. Coolamon ...	W. Lawrence, "Redbank," Marrar.	Turvey	Fallowed 4 inches first week June; harrowed twice June; springtoothed twice last week August; harrowed twice end November, springtoothed January and twice in April; harrowed twice after drill; crop harrowed when 6 inches high	April ...	80	90	17	38	18½	18½	18½	29½ (30)	25 (28)	148
5. Oaklands ...	C. Kerr, "Innesvale," Oaklands.	Federation ...	Fallowed July; harrowed August; springtoothed January; disced before sowing with combine.	End May.	60	60	1st crop.	43	18½	18½	19½	23 (24)	24 (24)	146½

DETAILS of Awards—*continued.*

Local Society.	Name and Address of Competitor.	Variety.	Methods of Cultivation.	When sown.	Quantity of Seed per acre.	Quantity of Superphosphate per acre.	Number of Crops grown previously.	Points Awarded. Apparent Yield. One point for every bushel.	Trueness to Type. Max. 20 points.	Freedom from Disease. Max 20 points.	Evenness. Max. 20 points.	*Cleanliness. Max. 30 points.	†Condition and Appearance. Max. 28 points.	Total Points.
6. Ganmain ...	G. H. Cox, "Oakleigh," Ganmain.	Turvey	Fallowed 4½ inches August; harrowed November and January; springtoothed May.	First week May.	70	70	Over 6	37	18	18	19	‡ 29 (30)	‡ 25 (28)	146
7. Henty ...	Shipard Bros., "Lister," Henty.	Minister, 25 acres; Turvey, 13 acres; Penny, 12 acres.	Fallowed 5 inches September; springtoothed November; harrowed December; springtoothed March; sown with combine; crop fed off July.	Mid April.	56	50	Over 6	35	18	18½	19	28 (30)	27 (28)	145½
8. Berrigan ...	G. R. Rintoule, "Balmoral," Berrigan.	Penny	Fallowed June and July; harrowed after plough; harrowed August; springtoothed and disced September and October, springtoothed before sowing; rolled after sowing.	First week May.	60	60	7	34	19½	17	18½	28 (30)	27 (28)	144
9. Narrandera ...	W. Verner, "Booleroo," Gillenbah	Yandilla King ..	Fallowed 5 inches September; harrowed October and March; springtoothed April.	23rd April.	60	90	Over 6	36	17½	17	18½	29 (30)	24 (28)	142
10. Finley ...	J. Tullock, "The Prairie," Finley.	Federation ..	Fallowed July; harrowed August and September; springtoothed first week March; sown with combine; crop fed off July.	1st May	60	80	Very old land	35	19½	14	18½	24 (30)	27 (28)	138
11. Yanco ...	G. Blencowe, "Forest Hut," Leeton.	Federation ...	Fallowed 3 inches August and September; harrowed February; springtoothed April.	Second week April.	60	56	1st crop.	30	17½	18½	19	24 (24)	23 (24)	132

* First crop, 24 points; second, 25; third, 26; fourth, 27; fifth, 28; sixth, 29; over six crops, 30 points. † First or second crop, 24 points; third or fourth, 25; fifth or sixth, 26; over six crops, 28 points. ‡ In parentheses are shown the maximum in each case.

THE NORTH-WEST.

G. C. SPARKS, H.D.A., Manager, Glen Innes Experiment Farm.

The winning crops of eight district competitions (Inverell, Moree, Narrabri, Boggabri, Gunnedah, Manilla, Tamworth, and Quirindi) were eligible for championship honors in this division, and the results of the judging for the championship are contained in the accompanying table.

Messrs. Forge and Sons' crop of Currawa was on red loam, on fallow worked in July to September. It gave an apparent yield of 33 bushels per acre, was standing well, and presented a very pleasing appearance. Although the crop approached more closely than any of its fellows to championship standards, it lost points because of a slight admixture of other varieties of wheat and a trace of barley; it also showed a slight sprinkling of thistles and black oats, and points were also lost owing to the presence of traces of foot-rot and bunt.

Messrs. Cosh Bros.' crop of Bomen yielded to the champion crop by only half a point. It is unfortunate that this crop should have been hail-damaged prior to inspection, as otherwise it seems almost inevitable that the position must have been reversed. As it is, the crop shared with the Turrawan (Narrabri) crop the distinction of giving the highest apparent yield of the series, viz., 35 bushels per acre. The crop was a little tangled and portions had gone down, and points were lost owing to the presence of "strangers" and black oats, but with the Boggabri and Manilla crops it gained highest points for freedom from disease.

Mr. Muir's crop of Federation was sown with a "broadcaster" on an August-September fallow, and the seed was disced in. The soil here was a heavy black loam overlying a black clay subsoil, originally gilgai land, and now cropped for the twelfth time. The apparent yield was 34 bushels, and the crop was standing well, as is common with this variety, but it suffered a heavy deduction of points for type and disease (notably bunt).

It is to be regretted that actual rainfall figures were not available for any of the crops inspected, but in a general way the wheat season throughout the north-west was a decidedly favourable one. Following the natural fallow occasioned by the drought of 1923, there was sufficient autumn rain to give the crop a fairly satisfactory start, and although the early winter was dry the heavy July precipitation gave a good carry over, and the spring and early summer proved eminently satisfactory. Hence the differences in results that might have been anticipated from varying cultural methods were not manifested, although it will, of course, be realised that the competing crops were remote from each other, and were subjected to variations in soil and climate.

Three only (less than 40 per cent.) of the competitive crops were on fallowed land, which is strongly indicative of a lack of standardisation in methods of tillage, and is probably the main factor operating against the development

of wheat culture in the north-west. In districts of relatively light, or in any way precarious rainfall, wheat culture is a hopeless proposition without a definite system of fallowing, and while it has long been recognised that in summer rainfall country, such as the north-west wheat belt, ample supplies of moisture can be conserved in normal seasons by a system of short or summer fallow, as now adopted to a certain extent by farmers in this territory, it is quite obvious that while short fallow is less productive than long or winter fallow, where it fails most noticeably is to give an adequate control of weeds and disease. The conclusion seems natural that, if there could be produced and widely adopted a standardisation of method along similar lines to that of the Riverina (with, of course, the necessary modifications to meet the special seasonal conditions of the north-west), there would unquestionably follow an elevation of the average wheat yield beyond the wildest hopes of to-day. The extraordinary potentialities of the north-west are illustrated by the statements of prominent farmers regarding the absence or at least relatively low percentage of total crop failures, without any effort being made at moisture conservation, even although the seasons have, of recent years, been below normal as to rainfall.

The crops were, on the whole, dirty, the ubiquitous black oat and various thistles being prevalent throughout. While an excessive weed growth is inevitable in good seasons, the presence of a liberal sprinkling of black oats in championship crops is a matter for considerable concern, and as this pest can only be adequately controlled by winter fallow, it provides another cogent reason for change in prevailing local practice.

The dominant feature of the competitive crops, however, was the failure as regards type and purity. The average of the points awarded under this section works out at less than sixteen, which is really less satisfactory than would appear, for the reason that champion crops only were being dealt with. In no case was the purity of any one crop up to championship standard, and in one instance it became a matter of some difficulty to determine exactly what variety of wheat constituted the bulk of the crop.

The necessity for trueness to type and pureness of seed cannot be too strongly stressed. It is imperative in order to secure maximum yield, for uniformity and economy of production and for general efficiency of working, and through the seed lies one of the great possibilities of crop improvement. Without any alteration being made in tillage method, a concentration by north-western farmers upon seed improvement would tend to elevate the local yield to a tremendous extent.

The difficulty of securing ample supplies of pure seed has now been practically overcome, and if farmers will make it a practice to secure annually small amounts of seed from Experiment Farms, or from those farmers who have been admitted to the list of pure-seed growers of the Department of Agriculture, it will be an easy matter to eliminate the undesirable types and " run out " seed now to be found in the north-west.

Seven different varieties of wheat were represented in the crops inspected. The winning Currawa is a prolific and very popular variety, but it has the serious defect of a rapid weakening of its matured straw and it requires harvesting without undue delay. The wheats occupying second and third place—Bomen and Federation—are not to be recommended, Bomen being subject to the objection on account of being a red wheat, and Federation being unsuited to the climate of the north-west. Of the four other varieties represented (Florence, Canberra, Hard Federation, and Queen Fan), the three former have already been recommended by the Department of Agriculture for growth in the north-west, and their choice by farmers can therefore be regarded as a wise one.

The crops carried quite an appreciable amount of disease, the most prevalent being rust. The incidence of rust is, of course, largely due to seasonal conditions, and is always to be anticipated in normal north-western weather. Control is vested mainly in early seeding and the use of resistant varieties, both of which are ordinary features of sound cultural methods. Bunt occurred in varying amounts in many of the crops inspected; it is usually indicative of carelessness, for if either of the three established methods of seed treatment are correctly followed the complete control of this disease must result. The three methods referred to (bluestone, formalin, and dry copper carbonate) were evenly represented in the crops inspected and with fairly uniform results, but there are many reasons why the copper carbonate treatment should receive preference among farmers, and it seems inevitable that the bluestone and formalin methods will sooner or later be abandoned. A remarkable feature of bunt control was the practice of Messrs. Cosh Bros., of Pallamallawa, who pin their faith to the formalin treatment, but who treat their seed only in alternate years. The seed used for this season's crop was treated in 1923, and as the crop compared more than favourably as regards bunt control with the other crops inspected ample testimony is borne to the scrupulous care with which the treatment must have been carried out.

Take-all and foot-rot were fairly prevalent, and in one instance a serious occurrence of flag smut. It was here that non-fallowed crops showed to disadvantage, and it is felt that a vigorous policy of fallow and rotation of crops (where practicable) is all that will be required definitely to control these diseases. In spite of the rust menace, the north-west has certain climatic advantages, and as regards diseases of wheat is in a very strong position.

From all the foregoing it would appear that the possibilities in wheat culture in the north-west are extraordinarily good, and even if the rainfall is less regular and less evenly distributed than the Riverina, the north-west has a fertility and certain other advantages all its own. If due consideration is given to the great factors of moisture conservation, seed selection, and disease and weed control, there seems to be no reason why wheat culture

there should not be placed upon a new and firmer foundation. It is here that the action of the Royal Agricultural Society in promoting and maintaining these field wheat competitions has been, and will be, productive of much good. By the creation of a competitive spirit, by locating the best crops, by studying the methods by which they were produced, and by focussing attention upon them there cannot fail to be exerted a stimulating influence upon rural thought and practice, which will ultimately reflect itself in the development of a definite system of tillage, crystallised as is that of the Riverina or the Wimmera, and applied to the wheat fields of the north-west with all the naturally accruing economic advantages. It is to be hoped that there will ultimately be accorded to the society that appreciation which its efforts so truly merit.

DETAILS of AWARDS.

Competitor.	Variety.	Cultural details.	Apparent Yield.	Trueness to Type.	Evenness.	Freedom from Disease.	Freedom from Weeds.	Condition and Appearance.	Total.
S. Forge and Son, Phillip, Tamworth	Currawa ..	Ploughed July to September, 1923. Portion springtoothed March and May; remainder disced April. Sown third week in May. Seed 60 lb. per acre. Red loam. Old land.	33	17	18½	17½	28	26	140
Cosh Bros., "Karoola," Pallamallawa.	Bomen .	Wheat stubble. Worked four times with combine (January, March, April, May). Sown mid-May. Seed 45-50 lb. per acre. Chocolate light loam. Old land.	35	17½	18	18	26	25	139½
W. C. Muir, 'Etondale,' Curlewis.	Federation..	Ploughed (disc) August-September, 1923. Harrowed November. Disced January. Springtoothed February. Harrowed April Sown May June. Broadcasted. Seed disced in, 45 lb. per acre Heavy dark loam. Old land.	34	16	18	16	28	27	139
V. McLeod, Delungra	Queen Fan	Wheat stubble, 1923. Crop failed, fed off. Stubble heavily stocked. Ploughed March and again heavily stocked. Skim-ploughed and sown May-June Seed 45 lb. Red loam. Old land.	33	17	17½	17½	26	27	138
F. Breaden, "Greylands," Turrawan.	Bomen Florence.	Wheat stubble. Ploughed December. Springtoothed three times. Disced once and harrowed. Sown first week in May. Seed 50 lb. Heavy black loam. Old land.	35	17	17	16	26	26	137
W. F. White, "Pine Grove,' Boggabri.	Canberra . .	Ploughed July, 1923. Harrowed November. Skim-ploughed January Harrowed and springtoothed three times. Sown mid-June. Seed 70 lb. Super 80 lb. Gravel red loam. Old land.	31	16	15	18	27	26	133
A. J. Nelmes, Braefield, Quirindi.	Hard Federation.	Wheat stubble. Ploughed January. Springtoothed four times. Sown early May. Seed 45 lb (ungraded). Dark loam. Old land.	27	16	18	15	28	26	130
W. E. Kirk, Wongo Creek, Manilla	Florence ...	Wheat stubble. Ploughed early January. Disced early May and harrowed. Sown mid-May Seed 50 lb. Red light loam. Old land.	26	11	19	18	28	26	128

Treatment of Seed Potatoes with Nitrate of Soda.

Treatment of seed potatoes with a weak solution of nitrate of soda was the subject of departmental tests at Hawkesbury Agricultural College and Grafton Experiment Farm last season. The trials were carried out following a statement by Professor Joseph T. Rosa, University of California, that in districts where two crops of potatoes are grown in the one season the sprouting of the seed for the second planting can be hastened by cutting the seed and immersing it for thirty to sixty minutes in a solution of nitrate of soda, made up at the rate of 3½ lb. of the fertiliser to 10 gallons of water.

In both tests treatment was seen to have a rotting effect on a large proportion of the tubers. At the College, of the treated and untreated (but cut) seed reserved for observation, 75 per cent. of the former developed a salmon-coloured fungal growth (*Verticillium* sp.), which more than half destroyed the tubers in some cases. The eyes of the treated tubers commenced to develop about a week after treating: the eyes of the untreated tubers showed very little development at the end of a month. By this time the majority of the treated seed had commenced to rot, while the untreated seed was still quite sound. The treated seed plot, on the other hand, came up fairly well, while the check plots (of untreated seed) on either side came up very unevenly.

At Grafton, of seed treated on 7th February, over 14 per cent. of the treated sets were found to be too decomposed for planting four days later. Germination in the field showed a difference of about 26½ per cent. in favour of the untreated sets, evidently due to decomposition of the treated sets after planting. Examination on 28th February of seed reserved for observation purposes showed the majority of the treated tubers to be decaying, while the untreated tubers were firm, and showed no sign of decomposition. Very little difference was noted in regard to sprouting, the treated tubers showing slightly to advantage only as to the number of sprouts per set. There was no noticeable difference in the growth of the plants or in the maturity of the crop.

Can it be Denied?

If industry in general were conducted as badly as agriculture in general, its profits would excite no envy. It could never have displaced agriculture as the paramount source of power and wealth. Consider the annual investment of time, energy, and money in the effort to teach better farming . . . Here is a farm problem—that so many farmers do not know the best methods of farming; but it is difficult to get a large number of these men to read the literature so abundantly provided.

The North Dakota Department of Agriculture made a survey of the cost of producing wheat in that State, with this amazing result:—The cost of growing wheat ranged all the way from 80 cents to 7 dollars a bushel. At a selling price on the farm of 2·50 dollars a bushel, 16 per cent. of the farmers would still be losing money, because it had cost them more than that to produce the wheat . . . Obviously the man who adds to the exportable surplus of wheat at a cost of production two or three times as great as the world price is wasting wealth. He is not an asset; he is a liability.—Garet Garrett, in the *Saturday Evening Post.*

Farmers' Experiment Plots.

WINTER GREEN FODDER EXPERIMENTS, 1924.

Upper North Coast.

W. R. WATKINS, H.D.A., Agricultural Instructor.

TRIALS with wheat, oats, and barley for late winter and early spring feed were carried out during the season 1924 in co-operation with the following farmers :—

H. Johnson, Condong, Tweed River.
M. McBaron, "Riverview," Raleigh.
J. D. Kirby, Ashton Farm, Shark Creek, Maclean River.
R. W. Hindmarsh, "Wiaraga," Bellingen.
M. McAuliffe, Tregeagle, *via* Lismore.
E. Green, The Risk, Kyogle.
C. Oliver, "Laureldale," Casino.

The seasonal conditions were in favour of good growth practically over the whole district, and some excellent crops were grown. Unfortunately, comparable results were not obtained from Kyogle or Lismore. At the latter place the crop ripened off very quickly and was too dry to weigh for green feed; it was left for grain, a good return of clean large grain being obtained.

The following table shows the rainfall during the growing period at the different centres :—

Month	Condong	Raleigh.	Bellingen	Casino.	Maclean.
	Points.	Points.	Points.	Points.	Points.
April	35	283	....	75	211
May	288	133	155	67	167
June	893	673	544	532	472
July	1,248	587	681	341	632
August	102	230	184	160	494
September ...	....	....	16	....	61
Total ...	2,566	1,906	1,580	1,175	2,037

The Plots.

Condong.—Soil, alluvial loam, situated on the banks of the Tweed River. The land was ploughed in December, disc harrowed twice, and planted on 12th April, the seed being harrowed in. The rainfall was heavy and several varieties rusted. The worst were Fulghum oats and Skinless barley, but Mulga was fairly bad and Ruakura was slightly affected. Harvesting was carried out at the latter end of August. The cows showed a distinct preference for the oats, leaving most of the wheat. The field peas and vetches did not make much growth.

Raleigh.—Soil, alluvial loam, inclined to be heavy; previously cropped with maize for silage. Ploughed early in March, disc harrowed four times owing to paspalum lumps, and planted on 15th April, and harrowed. Rust made its appearance on Fulghum oats and Skinless barley, the latter only growing a few inches. The field peas made excellent growth, but the vetches were poor. The plots were ready at the end of August.

YIELDS of Cereals and Cereal and Legume Mixtures for Green Fodder.

—	Condong.	Shark Creek.	Bellingen	Raleigh.	Casino.
	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.
Florence wheat and Golden vetches ...	8 17 0 16	9 7 1 0	....	....	10 5 1 17
Florence wheat and field peas ...	7 10 0 0	9 8 1 2	5 17 0 16	....	10 12 3 22
Gresley wheat and Golden vetches ...	....	....	5 8 2 8	....	....
Gresley wheat and field peas ...	....	....	....	13 15 2 0	....
Firbank wheat and Golden vetches ...	....	....	....	8 12 3 12	....
Florence wheat ...	7 15 2 24	7 16 2 17	....	....	....
Clarendon wheat ...	11 12 3 12	12 8 2 0	3 15 2 14	12 3 0 9	12 8 3 12
Early Bird wheat ...	7 1 1 20	....	2 0 0 0	5 8 0 4	8 14 1 9
Firbank wheat ...	8 14 1 4	....	3 10 0 0	....	8 10 3 18
Gresley wheat ...	9 8 2 8	8 18 1 1	....	....	8 4 2 6
Zealand wheat ...	8 17 0 16	8 7 2 10	2 4 1 4	6 17 2 8	8 10 1 20
Algerian oats ...	13 5 2 24	9 5 1 6	5 7 0 16	10 8 3 6	12 17 2 12
Fulghum oats ...	3 5 2 24	Patchy and rusted.	2 17 0 16	9 3 2 18	7 6 3 21
Mulga oats	12 5 2 24	,,	4 11 1 20	10 10 2 14	9 4 1 6
Ruakura oats ...	15 5 2 24	11 17 2 20	Failed ...	11 12 0 26	8 15 2 0
Sunrise oats... ...	12 14 1 4	11 4 2 16	5 0 0 0	9 13 2 8	10 6 3 8
Cape barley ...	8 18 2 8	9 12 1 6	2 11 1 20	8 4 3 12	8 14 2 10
Trabut barley ...	9 5 2 24	7 0 1 22	2 11 1 20	9 3 2 18	6 12 1 24
Skinless barley ...	3 5 2 24	Failed ...	Failed ...	Failed ...	3 0 2 6

Shark Creek.—Soil, alluvial loam, inclined to be clayey. Ploughed early in March, rolled and harrowed, planted on 9th April, and again rolled and harrowed. The heavy rainfall caused several of the varieties to rust, the worst being Fulghum and Mulga, while Ruakura and Sunrise showed signs. Early Bird and Firbank ripened very early and were too dry to provide comparable weights. With the exception of Algerian oats and Zealand wheat, all varieties were ready early in September. Both field peas and vetches made good growth. The previous crop was potatoes.

Casino.—Black volcanic soil of a heavy nature. Ploughed in December, and harrowed three times and ploughed again in March. Planting was carried out on 9th April. Skinless barley was practically a failure, but the remainder did well, especially Algerian and Sunrise oats and Clarendon wheat. The varieties were free from rust and were ready for feed towards the middle of September. The field peas and vetches made good growth.

Bellingen.—Soil, alluvial loam, previously cropped with maize. Ploughed early in March, disc harrowed twice, ploughed again in April, and planted 2nd May, then harrowed. Ruakura was badly affected with rust, and Skinless barley failed altogether. The crop germinated well, but made poor growth, owing, no doubt, to the land needing a spell, having been cropped continuously for many years. Harvesting was carried out towards the end of September.

RESULT of Fertiliser Trials with Florence Wheat.

Fertiliser per Acre.	Condong.	Shark Creek.	Raleigh.	Casino.
	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.
Superphosphate, 140 lb.	6 2 3 12	8 7 1 23	7 5 3 6	9 4 1 4
Superphosphate, 280 lb.	5 17 0 16	8 18 1 1	8 2 0 6	9 16 2 0
*M7, 182 lb.	7 4 1 4	8 12 3 12	10 10 2 14	9 9 3 21
*M5, 210 lb.	7 1 1 20	9 9 0 7	7 11 1 0	10 6 2 2
*P7, 126 lb.	5 11 1 20	8 18 1 1	8 5 2 14	9 15 1 16
No manure	7 15 2 24	7 4 3 21	7 0 1 22	8 10 2 8

* M7 mixture consists of ten parts superphosphate and three parts chloride of potash; M5, of two parts superphosphate and one part sulphate of ammonia; P7, of equal parts of superphosphate and bonedust.

Remarks.

The worst time of the year for the dairy-farmer of the Upper North Coast is the late winter and early spring, and it is at this period that good feed is an absolute necessity, as most cows are just "coming in" to milk. It is the time of the year when the Saccaline for winter feed is done, and pastures and any spring crops have not yet made sufficient growth for feed. It is at this period that the autumn-planted crops of wheat, oats, and barley prove their usefulness, providing good green succulent feed, just when it is so particularly needed. Plantings of these cereals made in March, April, and May will provide feed during July, August, and September. The rate of seeding recommended is 2 bushels per acre broadcast for cereals alone, and 1½ bushels when in combination with legumes such as field peas or vetches, which latter should be sown at the rate of half a bushel per acre.

A FARMER'S FALLACY.

THERE is a fallacy, almost never challenged, says Garet Garrett in the *Saturday Evening Post*, that whatever the farmer grows, wherever he grows it, he is entitled to a transportation rate that will enable him to sell it somewhere at a profit. He grows a head of lettuce in the far west and sells it in New York. What does it cost? He may not even inquire, but he complains that it costs too much. The railroad takes so much for hauling the lettuce that he cannot get a sufficient profit for growing it. The fact is that transportation is wasted by American agriculture in a perfectly wanton manner, car loads of potatoes continually passing in opposite directions. Examples might be multiplied almost without end.

Field Experiments with Maize.

GRAFTON EXPERIMENT FARM.

DEPTH OF CULTIVATION TRIALS, 1920-24, SUMMARISED.

G. NICHOLSON, H.D.A., Experimentalist.

THE maize plant is a comparatively shallow rooter; that is, the lateral roots, that form by far the largest percentage of the whole, are found close to the surface, although there are a number of roots that may penetrate to a depth of 4 or 5 feet. During the early stages of growth, roots will not be found close to the surface except in the near vicinity of the plant. Dry seasons favour the rapid development of lateral roots, while in wet seasons it has been found that spreading takes place at a much slower rate.

From the foregoing, then, it would appear that—

1. Deep cultivation, provided that it does not extend right to the rows, should be beneficial until the plants reach a height of from 12 to 18 inches, because a more effective mulch will be obtained, weeds will be more drastically dealt with and a better aeration of the soil results.

2. Deep cultivation continued for any great length of time will result in severe root pruning, particularly in dry or normal seasons, and on this account is not desirable.

3. During a wet season deep cultivation might be practised without doing a great deal of harm, mainly because the roots do not spread so rapidly, and a light pruning may not prove too harmful.

4. Shallow cultivation during the early stages of growth may not be desirable, inasmuch as weeds may not be so effectively controlled.

To test these theories, an experiment was commenced in 1919 to ascertain, under local conditions, which system shows the best return. The experiment was arranged as follows:—

Plot 1.—Shallow cultivation throughout, 2 to 3 inches.

Plot 2.—Deep cultivation throughout, about 5 inches.

Plot 3.—Deep cultivation until plants are 12 to 18 inches high, then shallow cultivation.

Plot 4.—Shallow cultivation throughout, 2 to 3 inches.

The permanent site selected for this experiment was on dark alluvial soil, fairly typical of the district.

The variety, Fitzroy, was planted each season in rows 4½ feet apart, at the rate of three grains every 40 inches, or equal to 8 to 9 lb. of seed per acre. Except in the first year (when the plots were sown on 19th November), planting took place from the middle to the end of December. All cultivations were discontinued after tasselling. The plots were not hilled, and no fertiliser was used.

Notes on Seasons.

1919-20.—The experiment was commenced, the previous crop being wheat. A total of 10 inches of rain, evenly distributed, fell during December and January, followed by somewhat drier conditions during February (266 points). A difference of 4 bushels was recorded between plots Nos. 2 and 3, in favour of the latter. Cultivations near tasselling time damaged a number of roots where deep cultivation was practised throughout, resulting in the lower yield.

1920-21.—Owing to floods during the winter of 1921, much of the maize was damaged, and no record of yields was made.

1921-22.—The plots were planted on 14th December, 1921, and over 5 inches of rain fell before the close of the year, followed by a very dry January (22 points), and a wet February, when nearly 10 inches fell. Plots Nos. 2 and 3 showed to advantage, which can be attributed to the fact that the heavy rainfall after planting caused a vigorous weed growth which was best dealt with by deep cultivation.

1922-23.—Planting was carried out on 22nd December, 1922. Nearly 3½ inches of rain fell during January, followed by 1½ inches in February, a similar amount in March, and over 10 inches in April. The good rains in April fell too late to offset the effects of root pruning caused by deep cultivation, which resulted in a decreased yield of 3½ bushels.

1923-24.—Planting was carried out on 19th December, 1923. The germination was good. Good rains fell during the latter part of December, 1923; in January there were 347 points, in March 284 points, and it was then somewhat dry to harvesting time. Shallow cultivation yielded 2½ bushels per acre more than where deep cultivation was practised.

RESULTS during Seasons 1919 to 1924.

Treatment.	1919-20.		1921-22.		1922-23.		1923-24.		Average Yields.	
	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.
Shallow cultivation throughout.	42	48	80	41	54	34	52	29	57	38
Deep, then shallow cultivation	43	16	85	54	52	32	50	0	57	53
Deep cultivation throughout	39	10	84	8	51	10	50	48	56	19

Conclusions.

The tabulated yields from the three different methods of cultivation do not show a great deal of variation, and it is somewhat difficult to arrive at a definite conclusion in favour of any one system for all seasons.

The principles already outlined are to some extent borne out by the results of this experiment, viz.:—

1. Deep cultivation until the plants have reached a height of 12 to 18 inches, followed by shallower cultivations during the later periods of growth,

will give best results in most seasons. By the adoption of this system, a greater control of weed growth is obtained than in the case where shallow cultivation is practised, and this, in itself, is worthy of consideration.

2. Deep cultivation throughout is not advisable except in wet seasons. In one year only, did this system out-yield the other two systems under trial, and in that year the season was favourable to such cultivation.

3. The practice of always cultivating shallow in normal seasons does not affect the yield greatly in comparison with deep cultivation at first followed by shallow cultivation in the later stages of growth.

Maize Experiments in the Southern District.

Experiments were conducted during 1923-24 in co-operation with the following growers:—

A. N. Stacey, "Camelot," Tumut.
T. C. Weedon, South Gundagai.

The season was very favourable to the growth of maize, and good yields were obtained on the Murrumbidgee River flats, near Gundagai, as well as along the Tumut River valley.

The 1923-24 summer was comparatively moist for this part of the State, and there was an absence of the hot, dry winds, which are usually experienced at this time of the year, along the Murrumbidgee. The result of this particularly favourable season was that maize crops on the fertile river flats near Gundagai, made very good growth. At Tumut also the season was favourable, but the summer was not quite as long as usual, and the cold weather checked the growth of some of the late crops.

The Tumut plots were sown on 9th November, on heavy black alluvial loam. The rows were 4 feet apart, and 2 cwt. of superphosphate per acre was applied to each plot. The rainfall for the growing period was as follows:— November, 59 points; December, 272 points; January, 14 points; February, 527 points; March, 99 points. Total, 971 points.

The Gundagai plots were sown on 2nd October, on fertile alluvial loam. The land had been ploughed in June, then skim-ploughed and cultivated with a disc cultivator, prior to sowing. The rows were 4 feet apart and three grains were dropped every 3 feet. The yields are as follows:—

Variety.	Gundagai.	Tumut.
	bus. lb.	bus. lb.
Leaming	71 16	....
Iowa Silvermine	60 0	50 22
Eureka	56 8	....
Funk's Yellow Dent	55 32	75 0
Coodra Vale	54 0	66 42
Leggett's Pride	47 0	....
Murrumbidgee Whitecap	40 48	51 0
Craig Mitchell	34 0	....

E. S. Clayton, Agricultural Instructor.

A Vine Poisonous to Stock.

(*Marsdenia rostrata.*)

H. R. SEDDON, D.V.Sc., and H. R. CARNE, B V.Sc.,
Veterinary Research Station, Glenfield.

DURING the month of January, 1924, a farmer in the Lismore district informed the Department of Agriculture that he had lost several pigs, through, he believed, the eating of a vine which was growing in his pig-run. Five animals became affected on 1st January, and of these three died after showing certain well marked symptoms, such as were later found to occur in our experimental animals.

He therefore forwarded a specimen of the vine, which was identified by the Government Botanist as *Marsdenia rostrata*, a native plant of the family Asclepiadaceæ. No common name exists for it in this State, but in Queensland it is known as " milk vine."

A search of official papers showed that during the previous year this plant had also come under notice as the suspected cause of mortalities in the Kiama district. Thus, from Bowman's Hill, via Mittagong, it had been reported during June, 1923, to be growing commonly, and, though previously not suspected as being dangerous, was considered likely to be responsible for sudden illness of a paralytic type in cattle, from which, however, recovery ultimately took place. The following month a correspondent at Barralier stated that as many as 200 sheep and a number of cattle had been poisoned in that locality by this plant within a few weeks and that cattle were still being affected. Though the vine was reported as occurring commonly in that district, it had not previously been suspected of being harmful, but there being then a shortage of other food stock had been forced to eat what otherwise they probably would not have touched.

In Queensland, also, it had previously been suspected of being poisonous to cattle (vide *Queensland Agricultural Journal*, vol. 17, 1922, p. 36).

In view of the above it was decided to conduct an investigation as to the toxic properties of this vine, supplies being obtained from each of the localities mentioned. Specimens of each of these were forwarded to the Government Botanist for identification, in addition to which he has kindly furnished the following botanical description :—

Marsdenia rostrata.—" A rather stout twiner, either glabrous on the young shoots and inflorescence or the whole plant tomentose-pubescent. Leaves on rather long petioles, ovate to almost orbicular, shortly and obtusely but usually abruptly acuminate, not cordate or very slightly so when very broad. Flowers sweet-scented, of a greenish-yellow or nearly white, numerous, in simple dense globular umbels, on interpetiolar peduncles shorter than the petioles. Pedicels 2 to 3 lines long. Calyx-segments broad, obtuse, about 1 line long. Corolla glabrous outside, the broad tube not contracted at the throat, nearly as long as the calyx, glabrous inside ; lobes rather longer, spreading, obtuse, very shortly bearded below the middle. Corona-segments with an adnate, scarcely prominent base, the free part erect, incurved, nearly as long as

or rarely longer than the anthers. Stigma produced into a flexuose beak, already as long as the corolla before it opens. Pollen masses oblong. Follicles broad, acuminate, not above 2 inches long."—(Bentham's "Flora Australiensis," vol. IV., p. 339).

Bentham (l.c.) gives the following localities for this species:—*New South Wales*—Hunter, Hastings, Clarence, and Tweed Rivers; Illawarra, and Blue Mountains. *Queensland*—Brisbane River, and Keppel Bay (?), the latter too young for accurate determination. *Victoria*—Snowy and Broadribb Rivers.

In addition to the above there are specimens from the following localities in the National Herbarium, Sydney:—Kurnell, Dapto, Kiama, Moss Vale, Gross Vale, Mount Tomak, Jenolan Caves, Collaroy Beach, Byron Bay, Clarence River, Richmond River, Merriwa.

Experimental Work.

A bag containing about 20 lb. of the plant was received from Lismore, and with it certain tests on pigs were conducted. Later samples of freshly gathered vine from Mittagong were tested and were also found to possess similar toxic properties. The results of these experiments are given in summary below.

Animals Susceptible.

The suspicion that this weed was poisonous to pigs, sheep, and cattle, has been confirmed by our tests here. It was not possible, however, to get them to eat the fresh plant, even when chopped up and mixed with chaff and bran, except in the case of the pig, and then only when incorporated with other food. A watery extract required to be disguised with a quantity of milk before pigs would take it; mixed with bran and chaff a sheep would not touch it, even though other food was withheld. The plant, both leaves and stems, yields a milky latex when broken, and it is to this probably that its distastefulness is due.

The weed is therefore, to say the least, unpalatable, and stock would probably not touch it under ordinary circumstances. During drought periods with shortage of grasses and herbage, stock are commonly fed upon native scrub and bush, and under such circumstances might be forced to eat the vine.

The effect on other species of animals has not been ascertained, but in all probability they likewise would be intoxicated.

A peculiar feature noticed in our experimental sheep was that an animal might show grave symptoms and then recover completely within a day or two. It would appear, therefore, that the toxic principle acts chiefly through the nervous system, and that it is speedily eliminated from the body.

Symptoms Induced.

In pigs, symptoms come on suddenly within an hour or two of drinking a watery extract, or of the ingestion of the leaves. That first noticed is unsteadiness of gait, and the animal may, in an attempt to walk or stand up, assume peculiar attitudes. Shortly after, the animal is found lying prone, struggling almost constantly, and squealing at intervals. Consciousness appears unimpaired, but equilibrium cannot be maintained even though the animal be placed on its feet. The respirations are laboured and the pulse is accelerated. Vomiting occurs frequently and there is a continual

champing of the jaws with consequent frothing from the mouth. The pupils are dilated and the reflex to light lost. With the extract, death occurs usually within two or three hours of the onset of symptoms, and is preceded by a short interval of coma. In an experiment wherein a small dose of the leaves was given, however, the animal showed severe symptoms for a couple of days, probably owing to continued absorption of sub-lethal amounts of the poison; as it then seemed unlikely to recover it was destroyed.

In sheep and cattle, symptoms did not follow drenching for a matter of several hours, and had the plant itself been eaten such interval would probably have been much longer. In them also the first symptom noticed is a staggering gait and then complete loss of equilibrium, the animal going down and lying struggling on the ground. Raised, it cannot stand. Respirations are laboured and the pulse accelerated. The animal seems fully conscious and may lie quietly until disturbed, when it struggles violently. Death, preceded by a short period of coma, occurs in one or two days.

In an odd case where a sheep was intoxicated but did not die, no ill effects were shown until eighteen hours after administration of a watery extract; then symptoms, quite severe in type for the ensuing twenty-four hours, followed by a gradual recovery which became complete in three days.

Post-mortem Appearances in Experimental Animals.

Pigs.—The following changes were noted in animals that died after eating the vine, or from drenching with its extract: Abdomen swollen; limbs extended; no discoloration of skin or discharge from natural openings, except frothy material vomited from mouth; pupils dilated.

On opening the carcase the blood appeared somewhat dark, and was not coagulated. The most marked changes were present in the stomach and bowels in which there was congestion of the lining membrane. The lesions varied from a diffuse congestion to scattered, clearly defined hæmorrhages under the surface layer, these latter being up to the size of a threepence in diameter. All parts of the bowel were affected to a greater or lesser extent, but the changes were most marked in the stomach, the last part of the small bowel, and the blind gut. No blood had escaped into the bowel, but some gaseous distention was present in all cases. The lining membrane of the mouth and nasal passages appeared somewhat congested, and the liver and kidneys were also congested. The urinary bladder was moderately distended. Heart dilated. Other organs presented no gross changes, except that in one case a quantity of vomited food had found its way into the windpipe and lungs.

Cattle.—In the only animal upon which we have had the opportunity of making a post-mortem examination a tympanitic condition of the abdomen was present, and the most marked changes were in the lining membrane of the fourth stomach and the large intestines. Here, again, there were numerous hæmorrhages and irregular areas of congestion scattered along the whole length of the bowel. The fourth stomach showed a diffuse congestion of the folds.

Sheep.—The lesions were similar to those seen in cattle.

Parts of the Plant found to be Toxic.

In our experiments the leaves (or watery extracts made therefrom) have been found to be toxic. The stems have not been specifically tested, but were included in some of our experiments. We have not had an opportunity of testing the flowering parts.

It has been found that not only the green leaves, gathered a day or two previously, but even dried-up and quite brittle leaves of plants collected over a month previously are toxic.

Toxic Dose.

In the absence of experiments wherein animals consumed the green plant, the toxic dose is ascertained only by reference to the experiments wherein a watery extract was drenched. It was found that the following proved poisonous :—Pigs (weaners), watery extract from 2 oz. green leaves; sheep, watery extract from 6 oz. green leaves; cattle (two years old), watery extract from 1½ lb. green leaves. It is quite possible that even much smaller quantities might cause death, particularly in pigs.

The amounts quoted are all much less than an animal might readily gather, and the plant must be regarded as highly poisonous.

Identification of Toxic Principle.

This is at present receiving attention, the necessary chemical work being undertaken by the Chemist's Branch of the Department. Preliminary tests have shown the presence of an alkaloid; but whether it is the active principle or not remains to be determined. From the results of one of our experiments, however, it would appear that the active principle is destroyed by heating in an acid solution.

Treatment.

Until the toxic principle has been identified and its action studied more fully, the most suitable remedial measures cannot be formulated. For stock known to have fed on the vine, a quickly acting purgative is indicated.

Prevention lies, of course, in the recognition and eradication of the plant from areas where stock are likely to gain access to it.

Summary.

1. *Marsdenia rostrata*, or "milk vine," is highly poisonous to ruminants and pigs.
2. Under ordinary circumstances it is not eaten, being unpalatable, but in time of drought stock may be forced to eat it.
3. Pigs may show symptoms in an hour or two, but with cattle and sheep they do not appear so suddenly.
4. The following symptoms are exhibited :—Staggering gait, animal goes down and is unable to get up, struggles more or less continuously; respirations laboured, pulse accelerated, pupils dilated; fully conscious until just before death. Pigs vomit frequently.

5. Death may occur in a few hours in the case of pigs; cattle or sheep die in one to two days.
6. Recovery after showing symptoms has been noted in an experimental sheep and in cattle which broused on the growing vine.
7. A toxic dose for young pigs may be contained in 2 oz. of leaves, for sheep in 6 oz., and for cattle in 1½ lb.
8. Not only the fresh green leaves, but also those that are dried up and brittle are toxic.
9. The only changes seen on post-mortem examination are areas of congestion and small hæmorrhages in the mucous membrane of the stomach and intestines.
10. The plant is a native of the coastal districts along the east coast of Australia. It belongs to the same family as the vine *Marsdenia condurango*, known as "Dog Poison" in South America.

We are indebted to Mr. H. G. Belschner, B.V.Sc., for assistance in carrying out certain of these experiments, and to Mr. Stock Inspector Hamilton, of Moss Vale, for supplies of the plant.

A full account of the investigational work appears in Science Bulletin, No. 24, Veterinary Research Report No. 1, of the Glenfield Veterinary Research Station (*in the press*).

A Variety Trial with Potatoes.

Mr. W. H. Scobie, Hon. Secretary, Oakhampton-Aberglasslyn branch of the Agricultural Bureau, sends the following details of a potato variety trial:—The potatoes (5 lb. of each variety) were planted on 21st August in good sandy loam with superphosphate (applied in the drills with the seed) at the rate of 3 cwt. per acre. Each variety planted a row about 25 yards long. The previous crop had been pumpkins. Conditions during growth were all in favour of good yields, which were as follows:—

Variety.	Date Harvested.	Marketable Yield.	Small Tubers.
	1924.	lb.	lb.
Irish Cobbler	22 Nov. ...	35	6
Gold Coin	28 " ...	42	6
Factor	6 Dec. ...	121	7
Early Manistoe	6 " ...	78	8
Manhattan	6 " ...	109	7
Satisfaction	6 " ...	69	9

The results are interesting, the variety Factor, which is the white skin variety recommended by the Department, outclassing all others. The yields from the earlier varieties are so low in comparison that prices would have to drop quickly to show a greater financial return over Factor.—A. J. Pinn, Special Agricultural Instructor.

Regulations under the Stock Diseases Act, 1923.

MAX HENRY, M.R.C.V.S., B.V.Sc., Chief Veterinary Surgeon.

NEW regulations have been issued under the Stock Diseases Act, 1923. It had been found that the Stock Diseases (Tick) Act, 1901, and the Stock Diseases (Tick) Amendment Act, 1915, were deficient in many respects, and that measures necessary to control disease could not be satisfactorily carried out under their provisions. The new Stock Diseases Act (which repeals the old Acts) was especially drawn up with these deficiencies in view, and may be held to have remedied them to a very great extent.

The regulations now issued are divided into several portions.

Part I, the preliminary, explains the subdivision of the regulations, and contains certain definitions to be used in interpreting them.

Part II contains the general provisions which are applicable to all diseases which have been proclaimed in accordance with Section 4 of the Act. They are chiefly machinery clauses relating to the various forms which will be used in connection with the working of the Act; laying down the procedure to be adopted in the case of stock seized or taken possession of by an inspector, and providing that the rescue of animals so seized should be considered to be a breach of the regulations; and governing the issue and cancellation of permits.

One of the important clauses provides that an inspector may order treatment as considered necessary before any permit is issued by him, and that after a permit has been granted he may on reasonable grounds cancel such permit.

It is provided that permits must be produced on demand made by any inspector or member of the police force.

Power is granted to the inspector when issuing an order to an owner to muster stock to require that he shall provide crushes if necessary and assistance in mustering.

Further provisions deal with the disinfection of premises and of attendants' clothes, the prohibition of shows and of stock sales, and the furnishing of returns of stock when required by an inspector.

Part III deals with cattle tick and tick fever, and lays down the conditions under which stock may be moved into, out of, or within quarantine areas declared to be such on account of the presence or suspected presence of cattle tick or tick fever.

Particular requirements are provided in connection with bullock teams, and crossing and re-crossing of horses over quarantine boundaries.

The treatment for hides and grass-seed is further laid down, and the inoculation of stock against tick fever and the transmission of cattle ticks and eggs is prohibited.

Power is granted for inspectors to brand any animal which is infected with tick fever or which is suspected of being so infected.

Part IV indicates the procedure to be carried out in areas declared to be quarantine areas on account of the presence or suspected presence of swine fever, contagious pneumonia, and necrotic enteritis of pigs, and provides for the necessary issue of permits for the movement of pigs into, out of; and within quarantine areas, and exempts from the necessity of being accompanied by a permit any pigs taken from any place outside a quarantine area, or from any holding which is not infected within a quarantine area to a registered slaughterhouse or a saleyard within the quarantine area.

Power is granted to the inspector to require a statutory declaration from the owner or person in charge of pigs, setting out whether the pigs are infected or not and the holding upon which the pigs have been during the immediately preceding twelve months.

It may be as well here to point out what is the meaning of "infected" for the purposes of this Act. "Infected" means that stock are diseased or in a flock or herd in which are any diseased stock, or that the stock have been kept, pastured, or travelled upon any land upon which diseased stock have been kept, pastured, or travelled during the next preceding twelve months.

It must not be assumed by the owners of stock that "infected" means diseased, but, as will be seen from the reading of the definition, the term has a much wider significance.

In *Part V* it is provided that where an area has been declared a quarantine area on account of the presence or suspected presence of sheep louse or sheep tick, no person may move sheep into, out of, or within such area unless a permit has been granted by an inspector.

In *Part VI* are laid down the requirements in connection with anthrax. Movement of animals is again prohibited unless a permit has been granted, and it is provided that vaccination may be ordered by an inspector, the vaccines which may be used being enumerated. All vaccinations must be reported by the person carrying out the work to an inspector, the date and place of such vaccination being given, as well as the class, number, and owner of the animals vaccinated, and the name of the vaccine used.

It may be mentioned here that vaccination can only be carried out by persons licensed in accordance with the provisions of the Noxious Microbes Act, 1901.

The destruction of carcases of animals which have died of anthrax by burning or burial at a depth of not less than 3 feet is provided for.

Blackleg is dealt with in *Part VII*, and here the movement of cattle from quarantine areas is prohibited except under permit.

In *Part VIII* (wherein tuberculosis is dealt with) it is provided that an inspector may apply the tuberculin test to any animal infected or suspected of being infected, and may use either the ophthalmic, intradermal, or subcutaneous method, or any combination of these methods.

Pleuro-pneumonia contagiosa is dealt with in *Part IX*, and here again the movement of cattle into, out of, or within any quarantine area declared on account of the presence or suspected presence of pleuro-pneumonia contagiosa is prohibited, unless a permit for such removal has been issued by an inspector.

It is provided that an inspector may order inoculation either with natural or prepared virus, and that where natural virus is being used, he may require that it be virus from a particular animal.

Before animals are inoculated against pleuro-pneumonia, authority is required from the Chief Veterinary Surgeon of the Department of Agriture, and any person inoculating must report such inoculation within two days to an inspector, giving the date and place of inoculation, number of animals inoculated, and the nature and source of the virus used.

Part X provides that no person shall vaccinate cattle with living abortion bacilli without the permission of the Chief Veterinary Surgeon of the Department of Agriculture, and such vaccination shall be immediately reported when carried out.

It will be noted that these regulations are brief, but wide powers are granted by them. The details of treatment, control, &c., will be arranged by administrative action within the powers granted by the Act and the regulations. It is, of course, obvious that such method of working is advantageous to those controlling the disease, since it enables action to be varied in accordance with the conditions existent in any particular instance. It is also of considerable advantage to the stockowner. It frequently happens where regulations are made in too great detail and definite requirements are laid down, it becomes necessary to hold the stockowner to a certain course of action when a modification might quite safely be arranged. Under these regulations it will be possible to modify action at times in such a way as to grant a stockowner relief when such can be done with safety.

The regulations should, of course, be read in conjunction with the Act, as most of the powers which can be exercised by inspectors are detailed therein. Such powers are not repeated in the regulations, as there was no necessity to do so.

It may be said that the true value of the maize crop will not be properly realised until it is utilised to a greater extent on the farm where it is grown. By combining maize-growing with live-stock raising, but little of the actual crop need leave the farm.—H. Wenholz, Special Agricultural Instructor.

Census of Fruit Planted in N.S.W.

THE collection of a census of the fruit trees in Australia was much before fruit-growers two or three years ago, and the figures presented in the accompanying tables are likely to be scanned with considerable interest

At a conference, held in Melbourne on 11th May, 1924, when representatives of the Governments of New South Wales, Victoria, and South Australia were present for the purpose of considering the position of the dried and canned fruits, it was regarded as important that some indication should be obtained of the production of the various fruits within the Commonwealth, and it was resolved to ask the State Governments to arrange for a census to be taken of the trees within their boundaries.

That proposal was taken up seriously in New South Wales and forms were distributed to growers pointing out the desirability of the information being made available and its importance to the development of the export trade in fresh, dried, and canned fruits. Unfortunately other States have not co-operated in the measure hoped for. Queensland and Tasmania definitely decided not to take the census, and progress in Victoria and South Australia has been slow. In Western Australia it it understood the census is proceeding.

In this State the collection of this information has proved a lengthy matter, but with the co-operation of the growers, and the assistance of the police as the collecting agents, the forms sent out were filled in and returned. Even then the task of compiling the figures into tables and presenting them in statistical forms involved a large amount of labour for the staff of the Government Statistician. The whole of the work has now been completed, however, and the following statements are the result:—

POME FRUITS.

Kind and Variety.	Trees of Bearing Age.	Young Trees not Bearing.
Apples.	No.	No.
Carrington	44,461	2,831
Cleopatra (N.Y. Pippin)	11,983	14,772
Cox's Orange	2,256	1,325
Delicious	13,629	8,651
Dumelow	266	13
Dunn's (Munro's Favourite)	8,191	2,182
Emperor Alexander ...	2,035	193
Esopus (Spitzenberg)...	1,794	114
Fameuse (Pomme de Niege)	10,470	2,470
French Crab	1,774	341
Granny Smith ...	127,834	88,746
Gravenstein (Carpenter)	25,745	18,069
Jonathan	140,536	63,151
King David	15,311	11,703
London Pippin (Five Crown)	93,012	19,807
Apples—*continued.*	No.	No
Northern Spy	7,082	1,861
Reinette de Canada ...	1,393	133
Ribston Pippin ...	1,249	280
Rome Beauty	47,780	20,008
Scarlet Nonpariel ..	2,146	645
Statesman	1,658	997
Stone Pippin (Winter Pearmain of N.S.W.)	9,153	780
Sturmer	6,918	3,447
Stewart's Seedling ...	377	373
Shorland Queen ...	171	177
Tasma (Democrat) ...	8,072	12,637
William's Favourite ...	1,903	527
Worcester Permain ...	807	491
Yates	5,500	3,004
All other varieties ...	104,866	30,482
Total number of Trees...	698,372	310,210

POME FRUITS—*continued.*

Pears.

Kind and Variety.	Trees of Bearing Age.	Young Trees not Bearing
	No.	No.
Beurre Bosc	11,589	12,058
Beurre de Capiaumont	5,888	3,505
Beurre Clairgeau ...	1,231	278
Beurre Diel	703	147
Beurre Easter	622	425
Black Achan	1,355	737
Broom Park	1,038	3,453
Clapp's Favourite ...	1,865	909
Doyenne du Comice ...	1,029	286
Gansell's Bergamot ...	2,070	540
Glou Morceau	1,953	186
Howell	3,258	4,285
Josephine de Malines...	9,504	6,573
Kieffer	5,319	3,230
Louise Bonne de Jersey	648	180
Marie Louise	824	193
Packham's Triumph ...	38,875	23,974
Vicar of Winkfield (Napoleon)	2,652	625

Pears—*continued.*

Kind and Variety.	Trees of Bearing Age.	Young Trees not Bearing.
	No.	No.
Williams (Bartlett) ...	100,424	34,503
Winter Nelis	8,224	6,515
Winter Cole	21,811	7,668
All other varieties ...	29,503	11,413
Total number of Trees...	250,385	121,683

Quinces.

Kind and Variety.	Trees of Bearing Age.	Young Trees not Bearing.
Apple	4,918	457
Large Portugal ...	7,463	1,280
Missouri Mammoth ...	4,324	1,520
Pear Shaped	3,655	1,176
Pineapple	590	307
Rea's Mammoth ...	2,026	613
Smyrna...	222	13
Van Deman	879	834
All other varieties ...	13,915	3,010
Total number of Trees...	37,992	9,210

CITRUS FRUITS.

Oranges.

Kind and Variety.	Trees of Bearing Age.	Young Trees not Bearing
Blood (varieties) ...	850	373
Compuda	564	36
Golden Nugget, Navel	1,504	556
Jaffa	8,423	1,065
Joppa	52,240	21,140
Mediterranean Sweet ...	9,936	2,608
Navalencia	12,000	2,893
Parramatta	244,419	11,610
Sabina	109	51
Seville	33,760	9,462
St. Michael	9,245	922
Paper Rind St. Michael	2,954	239
The Queen	1,582	107
Thompson's Improved Navel	16,946	3,543
Valencia Late	385,315	205,078
Washington Navel ...	227,083	190,685
White Siletta	34,596	9,586
All other varieties ...	109,993	14,396
Total number of Trees...	1,151,519	474,350

Mandarins.

Kind and Variety.	Trees of Bearing Age.	Young Trees not Bearing
Beauty of Glen Retreat	3,157	1,467
Dancy's	1,969	479
Emperor	432,726	133,213
Nobilis	92	48
Satsuma	509	159
Scarlet	1,824	1,806
Thorny	19,680	4,021
All other varieties ...	9,681	2,732
Total number of Trees...	469,638	143,925

Lemons.

Kind and Variety.	Trees of Bearing Age.	Young Trees not Bearing.
Eureka	9,674	5,163
Genoa	727	84
Lisbon	99,196	23,731
Messina...	432	113
Sweet Rind	76,624	32,749
Villa Franca	984	324
All other varieties ...	5,046	460
Total number of Trees...	192,683	62,624

Limes.

Kind and Variety.	Trees of Bearing Age.	Young Trees not Bearing.
Tahiti	18	7
West Indian	29	1
All other varieties ...	596	127
Total number of Trees...	643	135

Grapefruit.

Kind and Variety.	Trees of Bearing Age.	Young Trees not Bearing.
Marsh's Seedless ...	1,378	2,507
Triumph	387	74
All other varieties ...	1,649	1,373
Total number of Trees...	3,414	3,954

Pomelo shaddock.

Kind and Variety.	Trees of Bearing Age.	Young Trees not Bearing.
Total number of Trees...	204	526

STONE FRUITS.

Apricots.

Kind and Variety.	Trees of Bearing Age. No.	Young Trees not Bearing. No.
Alsace	653	50
Allen's Early	5,994	691
Blenheim	1,020	106
Camden Superb ...	6,670	932
Campbellfield	649	97
Hemskirke	1,055	481
Mansfield	9,278	1,028
Moorpark	31,315	4,424
Newcastle	12,110	1,663
Oullin's Early	4,441	418
Royal	1,415	496
Shipley	1,124	243
Trevatt...	36,725	47,050
Tilton	294	229
Warwick	280	233
All other varieties .	14,299	2,880
Total number of Trees...	127,322	61,021

Cherries.

Kind and Variety.	Trees of Bearing Age.	Young Trees not Bearing.
Bigarreau Twyford ...	3,933	586
Black Republican ...	5,789	5,446
Burgsdorf's Seedling ...	2,756	2,054
Bedford Prolific ...	1,629	896
Claremont	1,411	41
California Advance ...	516	195
Early Lyons	25,292	12,314
Early Rivers	2,675	471
Early Purple Guigne...	4,639	1,009
Eagle's Seedling ...	2,368	954
Florence	21,919	8,914
Kentish	1,551	224
Monstreux de Mezel ...	103	16
Napoleon	12,718	6,082
Noble	3,673	4,764
St. Marguerite... ...	43,186	26,847
All other varieties ...	22,559	7,827
Total number of Trees...	156,717	78,640

Nectarines.

Kind and Variety.	Trees of Bearing Age.	Young Trees not Bearing.
Albert Victor	1,219	178
Cardinal	1,826	188
Early Rivers	3,412	557
Elruge	431	176
Goldmine	10,248	5,384
Irrewarra	851	231
Lee's Seedling ...	1,081	158
Lord Napier	373	70
Meek's Scarlet... ...	861	84
Mrs. Dr. Chisholm ...	193	125
New Boy	1,014	494
Stanwick	259	94
Victoria (Rivers) ...	149	34
All other varieties ...	5,692	693
Total number of Trees...	27,609	8,466

Peaches.

Kind and Variety.	Trees of Bearing Age. No.	Young Trees not Bearing. No.
Alexander	2,824	299
Brigg's Red May ...	32,344	2,499
Comet	3,468	134
Early Crawford ...	11,420	1,102
Early Rivers	7,016	649
Edward VII	15,106	2,528
Elberta...	143,446	15,780
Foster	4,500	164
Golden Queen	14,850	26,631
Goodman's Choice ...	3,638	8,720
Gold Dust Cling ...	2,485	981
Hales' Early	10,187	1,300
High's Early Canada...	3,545	684
Kia Ora	4,217	416
Late Crawford... ..	3,622	187
Lady Palmerston ...	6,395	639
Lemon Cling	2,372	279
Levis Cling	1,266	7,347
Lovell	383	108
Lord Palmerston . .	690	51
Muir	710	37
McDevitt's Cling ...	8,308	879
Pelora	1,054	179
Phillips' Cling	8,447	4,388
Pullar's Cling	60,049	20,598
Royal George (Cling) ...	7,086	395
Royal George (Free) ...	2,933	243
Salwey	6,126	1,072
Sim's Cling	1,151	8,274
Shipley's Red	2,030	109
Sneed	1,469	30
Thieles' Cling	1,956	939
Triumph	12,507	796
Tuscan Cling	1,253	6,573
Wiggins	11,033	1,729
All other varieties ...	121,290	20,083
Total number of Trees...	521,176	136,822

Plums and Prunes.

Kind and Variety.	Trees of Bearing Age.	Young Trees not Bearing.
Angelina Burdett ...	16,658	9,118
Blue Imperatrice ...	1,890	36
Coe's Golden Drop ...	3,408	618
Damson, Lutherborough	3,262	272
Damson, other varieties	1,009	207
Diamond	5,128	1,960
Early Orleans	2,935	275
Evan's Early	2,423	375
Fellemberg (Italian) ...	2,913	484
Grand Duke	14,175	11,126
Giant	4,109	1,845
Greengage	3,210	359
Jefferson	186	157

STONE FRUITS—*continued.*

Plums and Prunes—*continued.*

Kind and Variety.	Trees of Bearing Age.	Young Trees not Bearing.
	No.	No.
Late Orleans	2,042	154
Magnum Bonum ...	1,739	421
Monarch	539	231
Pond's Seedling ...	9,518	5,217
President	23,527	19,269
Prune d'Agen	34,288	132,117
Prince Englebert ...	838	80
Purple Gage	1,951	313
Robe de Sergeant ...	28,884	83,207
Tragedy	216	481
Victoria	119	15
Washington ...	421	127
All other varieties ...	33,051	8,643
Total number of Trees...	198,629	277,107

Plums (Japanese).

Kind and Variety.	Trees of Bearing Age.	Young Trees not Bearing.
	No.	No.
Apple	602	44
Burbank	10,437	1,262
Chalco	556	114
Climax	1,477	223
Kelsey	2,009	218
October Purple .	4,281	887
Santa Rosa ...	9,262	2,962
Satsuma (Blood) ..	21,095	4,545
Shiro	11,970	1,500
Skipper...	448	90
Wickson . .	14,359	2,254
Wright's Early	2,194	428
All other varieties .	19,014	5,694
Total number of Trees..	97,704	20,221

MISCELLANEOUS.

Olives.

Kind and Variety.	Trees of Bearing Age.	Young Trees not Bearing.
Black Italian	29	3
Bonquettier	22	.....
Gros Rondoneau . .	11	.. .
Hardy's Mammoth ..	89	1
Late Blanquette ..	10	......
Lucca	26	1
Verdale...	84	6
All other varieties ...	530	464
Total number of Trees..	801	475

Figs.

Kind and Variety.	Trees of Bearing Age.	Young Trees not Bearing.
Adam	166	35
Black Genoa	1,262	300
Brown Turkey... ...	1,572	639
Castle Kennedy ..	59	18
Ischia, Black	90	6
Ischia, Brown	371	87
Ischia, White	157	......
Poulette	9	25
Smyrna...	225	32
White Adriatic . .	1,673	240
White Genoa	434	123
All other varieties ...	2,450	398
Total number of Trees...	8,468	1,903

Persimmons.

Kind and Variety.	Trees of Bearing Age.	Young Trees not Bearing.
Dai Dai Maru	11,091	2,413
Hyakumo	309	138
Jubilee	467	93
Sugar Loaf	1,161	460
Tanenashi	344	115
William's Seedless ...	1,050	120
Yemon	1,426	480
All other varieties ...	3,912	926
Total number of Trees...	19,760	4,511

Nuts (Almonds).

Kind and Variety.	Trees of Bearing Age.	Young Trees not Bearing.
Brandis Jordan ..	4,377	2,731
Burbank	1,036	715
Chellaston	67	10
I.X.L.	1,028	573
Nonpariel, White ..	1,073	905
Nonpariel, Hatch's ...	915	1,186
Ne Plus Ultra	220	270
Paper Shell	7,075	3,544
Peerless	778	1,206
All other varieties . .	4,873	3,065
Total number of Trees ..	21,452	14,205

Nuts (Walnuts).

Kind and Variety.	Trees of Bearing Age.	Young Trees not Bearing.
Common	2,576	1,073
Dwarf Prolific	516	73
Franquette	105	155
Japanese	124	193
La Parisienne	24	23
Large Fruiting ...	217	10
Mayenne	65	73
Thin Shelled	977	302
All other varieties ...	909	465
Pecan Nut	51	37
Total number of Trees...	5,564	2,404

Bananas.

Kind and Variety.	Trees of Bearing Age.	Young Trees not Bearing.
Cavendish	1,074,024	386,187
Gros San Michael ...	10	......
Lady's Finger	1,002	7
Sugar	1,203	84
All other varieties ...	13,066	7,031
Total number of Trees...	1,089,305	393,309

MISCELLANEOUS—*continued.*

Pineapples.

Kind and Variety.	Trees of Bearing Age.	Young Trees not Bearing.
	No.	No.
Common Rough Queen	52,360	19,950
Ripley Queen	7,051	580
Smooth Leaf Cayenne...	15,882	700
All other varieties ...	1,950	2,300
Total number of Bushes	77,243	23,530

Loquats.

Kind and Variety.	Trees of Bearing Age.	Young Trees not Bearing.
Enormity	620	75
Herd's Mammoth ...	5,997	924
All other varieties ...	3,827	600
Total number of Trees...	10,444	1,599

Raspberries.

Kind and Variety.	Trees of Bearing Age.	Young Trees not Bearing.
Fillbasket	1,606	603
Fillbasket Thornless ..	... ..	4
Golden Queen	......	500
Hunter's Perfection ..	... ..	......
Northumberland .	200	......
Red Antwerp	95	......
All other varieties ..	956	95
Total number of Bushes	2,857	1,202

Loganberries.

Kind and Variety.	Trees of Bearing Age.	Young Trees not Bearing.
All varieties	4,090	301

Strawberries.

Kind and Variety.	Trees of Bearing Age.	Young Trees not Bearing.
Aurie	1,220	15,000
Ettersburg	21,674	4,250
Melba	46,619	11,300
Phenomenal	5,291	7,905
Sunbeam	2,463	2,585
Cresswell	114,443	29,155
All other varieties ...	77,878	173,760
Total number of Plants	269,588	243,955

Gooseberries.

Kind and Variety.	Trees of Bearing Age.	Young Trees not Bearing.
Billy Dean	1,143	663
Crown Bob	2,354	704
Overall	30	......
Roaring Lion	14,855	11,322
All other varieties ...	3,783	41
Total number of Bushes	22,165	12,730

Mulberries.

Kind and Variety.	Trees of Bearing Age.	Young Trees not Bearing.
	No.	No.
Black English	578	85

Currants (Black).

Kind and Variety.	Trees of Bearing Age.	Young Trees not Bearing.
	No.	No.
Black Naples	180	410
Carter's Black ..	42	....
Champion	12	.. ..
Dunnett's	.... ..	....
Lee's Prolific	880	.. ..
All other varieties .	554	1,005
Total number of Bushes	1,668	1,415

Currants (Red and White).

Kind and Variety.	Trees of Bearing Age.	Young Trees not Bearing.
Versailles	1,376	152
All other varieties	2,901	729
Total number of Bushes	4,277	881

Passion Fruit.

Kind and Variety.	Trees of Bearing Age.	Young Trees not Bearing.
	190,799	83,314

Custard Apples.

Kind and Variety.	Trees of Bearing Age.	Young Trees not Bearing.
All varieties	38	63

Mangoes.

Kind and Variety.	Trees of Bearing Age.	Young Trees not Bearing.
	107	35

Paw Paws.

Kind and Variety.	Trees of Bearing Age.	Young Trees not Bearing.
All varieties	18	55

Raisin Grapes.

Kind and Variety.	Trees of Bearing Age.	Young Trees not Bearing.
Gordo Blanco (Muscat)	133,072	106,267
Muscat of Alexandra...	31,231	2,563
Sultanas	245,393	295,553
Waltham Cross ...	16,303	42,791
Zante Currants ...	83,652	94,822
All other varieties ...	6,323	24,919
Total number of Vines...	515,974	566,915

MISCELLANEOUS—*continued.*

Table Grapes.

Kind and Variety.	Trees of Bearing Age.	Young Trees not Bearing.
	No.	No.
Black Prince	60,679	2,507
Black Hamburg ...	216,260	22,958
Black Malaga	6,114	490
Black St. Peter (Alicante)	2,767	70
Centennial	5,127	216
Chasselas	14,789	3,018
Cinsaut...	3,386	100
Doradillo	350,941	128,229
Flame Tokay	4,458	1,036
Gros Colman	13,268	1,203
Keep's Red Champion..	4,066	29
Lady's Finger (Cornichon Blanc)... ...	29,073	20,087
Madresfield Court ..	740	6
Madeline (various) ...	411	120
Mrs. Pince Black Muscat	172,648	52,678
Muscat, Hamburg . .	335,486	66,422
Ohanez	42,084	78,616
Purple Malaga... ...	942	1,276
Purple Cornichon .	57,296	25,936
Raisin de Dame ...	3,791	832
Red Prince	1,677	128
Red Malaga	1,206	252
Santa Paula	84	... ..
Valensi	304	......
Waltham Cross ...	14,478	4,145
Wortley Hall	1,418	4
All other varieties ...	245,677	34,144
Total number of Vines...	1,589,170	444,502

Wine Grapes.

Kind and Variety.	Trees of Bearing Age.	Young Trees not Bearing.
	No.	No.
Alicante Bouschet ...	120,930	25,130
Alvardhao	13,000	......
Aucerot	30,706	......
Bastardo	6,577	......
Black Shiraz (Hermitage)	1,247,120	465,187
Cabernet	64,711	1,600
Carignane	286	......
Chasselas	6,440	10,000
Furmint	9,900	2,300
Grenache	78,722	110,360
Malbeck	34,512	6,250
Mataro	23,900	47,250
Miguel do Arco ..	3,666	4,500
Mondeuse	3,000	......
Pedro Ziminez... . .	62,792	50,552
Pedro Rutherglen ...	35,472	55,688
Riesling	588,523	123,881
Touriga...	4,170	604
Tokay Rutherglen ...	37,030	16,639
Uni Blanc	58,874	12
Verdeilho	39,587	4,542
All other varieties ...	449,858	229,416
Total number of Vines...	2,919,776	1,153,911

Miscellaneous Fruits.

Kind and Variety.	Trees of Bearing Age.	Young Trees not Bearing.
Total number (Miscellaneous)	2,110	1,046

When Farm Conditions are Normal.

We should guard against thinking of wartime conditions as normal in agriculture. People made money easily and spent it the same way. But such conditions are as abnormal as have been the conditions of the past three years. Farm conditions are normal when by hard work, careful buying, and the exercise of reasonably good judgment the farmer is able to meet his obligations and get ahead a little as time goes on. Even in what we call good times there are always some who make a bare living or less through bad luck or poor management. We must expect that, in farming and every other industry. So if we wait for the time when every farmer makes good money every year, and when there is plenty of it to spend for this, that, and the other thing, we shall probably wait a long long time. We will not do ourselves any good by misjudging what are normal conditions in any industry.—*Drovers' Journal*, Chicago.

Pasture Improvement.

WORK IN THE CROOKWELL DISTRICT.

J. N. WHITTET, H.D.A., Agrostologist.

Mr. C. E. PRELL, of Gundowringa, Crookwell, has over 1,000 acres of improved pastures on his property of 7,000 acres. The grasses which are doing best are Toowoomba Canary (*Phalaris bulbosa*), Tall Oat (*Avena elatior*), Hooker's Fescue (*Schedonorus Hookerianus*), Cocksfoot (*Dactylis glomerata*), Wimmera Rye (*Lolium subulatum*) and Perennial Rye (*Lolium perenne*). Sheep's Burnet (*Poterium sanguisorba*) has also been largely sown on the unploughed hills in past years, but owing to the phenomenal results obtained during the past two years with Subterranean clover (*Trifolium subterraneum*), the Burnet is being supplanted by this clover.

Cow Grass clover (*Trifolium pratense*, var *perenne*) has been largely sown on cultivated land with Cocksfoot and Perennial Rye with good results.

Mr. Prell is a breeder of Corriedale sheep, and works his country with the idea of cropping it with two or three cereal crops of oats for grain, followed by a similar number of potato crops. The areas are then planted with mixtures of permanent pasture grasses and clovers.

The native grass pastures of this district are invariably of poor quality, being composed mainly of Tussocky Poa (*Poa caespitosa*), a very fibrous plant, Kangaroo (*Themeda Forskalii*), Rat Tail (*Festuca bromoides*), Barley grass (*Hordeum murinum*), Soft Brome (*Bromus mollis*), Shivery or Tottering grass (*Briza minor*), Wheat grass (*Agropyrum scabrum*), Wallaby grasses (*Danthonia semiannularis, D. pilosa, D. racemosa*), Long-haired Plume (*Dichelachne crinita*), Short-haired Plume (*Dichelachne sciurea*), also two introductions, Ball clover (*Trifolium glomeratum*) and Hop clover (*Trifolium procumbens*). Sorrel (*Rumex acetosella*), Dandelion (*Hypochaeris radicata*), and other weeds constitute the remaining plants in the pastures. Of these plants Wheat, Wallaby, and Plume grasses provide fairly good feed, and also the Ball and Hop clovers.

The improved pastures in December, 1924, were carrying succulent feed, whereas the majority of the native grasses were dry and unpalatable.

Better Pastures mean Better Sheep.

The average value of grazing land in the Crookwell district is from £5 to £6 per acre. This value covers land on which the timber is dead but not cleaned up. It is estimated by Mr. Prell that this class of country, when improved and planted with good grasses and clovers, would increase in value by at least 100 per cent.

The first twelve months of a sheep's life is the most critical period, and if succulent feed is available during that time the animal builds up its constitution and is thus less liable to disease. The improved constitution also means that the animal is fitted to produce a better class of wool.

When relying solely on the native grasses for feed the sheep on this property had to be drenched for worms at periodic intervals, but now that improved pastures are available this work is not necessary. Improved pastures in this district have demonstrated their value in providing more and better wool and meat, and in lessening the danger from disease.

Carrying Capacity.

The average carrying capacity of cleared native grass areas subdivided into small paddocks is one sheep per acre in average seasons.

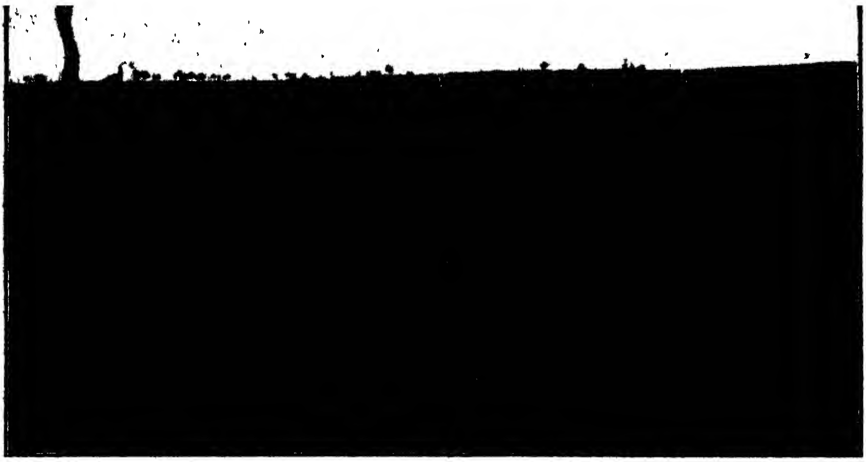


Fig. 1.—A Comparison.

On the left, rough tussocky native grasses; on the right, improved pasture providing succulent feed.

On an area of 200 acres, sown in June, 1923, with a mixture of Cocksfoot 4 lb., Perennial Rye 20 lb., Cow Grass clover 2 lb., and Sheep's Burnet 2 lb.—total 28 lb. seed per acre—six weaners per acre were carried from January to May, 1924, and when the photograph that forms Fig. 1 was taken on 22nd October—five months later—there was succulent feed 18 inches deep on the paddock.

At the present time (December, 1924) this paddock is being stocked at the rate of six sheep per acre, and the feed is over the animals' backs as shown in Fig. 2.

Where Subterranean clover has been worked in amongst the native grasses very considerable improvement has been effected in the carrying capacity of these areas. In the autumn of 1922 over 100 acres were gone over with the springtooth cultivator and seed of this clover broadcasted at the rate

Fig. 2.—An Improved Pasture
Showing a large body of feed even when stocked at the rate of six sheep per acre.

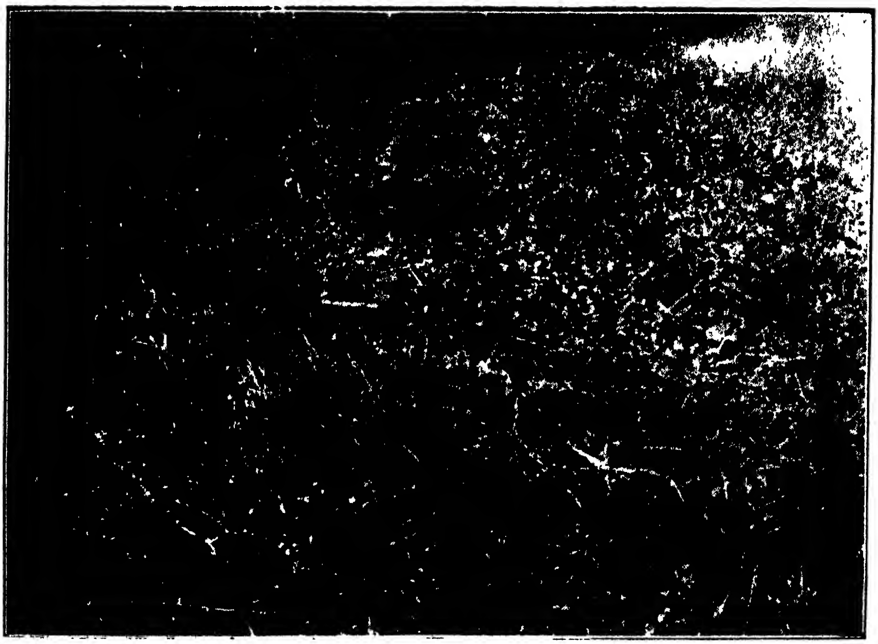


Fig. 3.—Subterranean Clover, worked in amongst Rough Native Feed.
The seed was sown in the autumn of 1922, and the clover is now spreading rapidly.

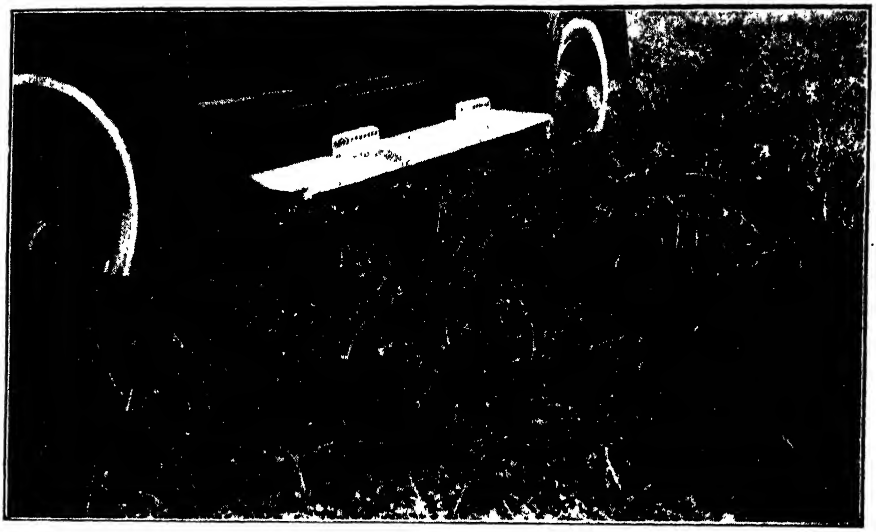


Fig. 4.—Subterranean Clover top-dressed with 140 lb. Superphosphate per acre.
The photograph was taken in December, 1924, from a position just beyond the white spot in Fig. 5.

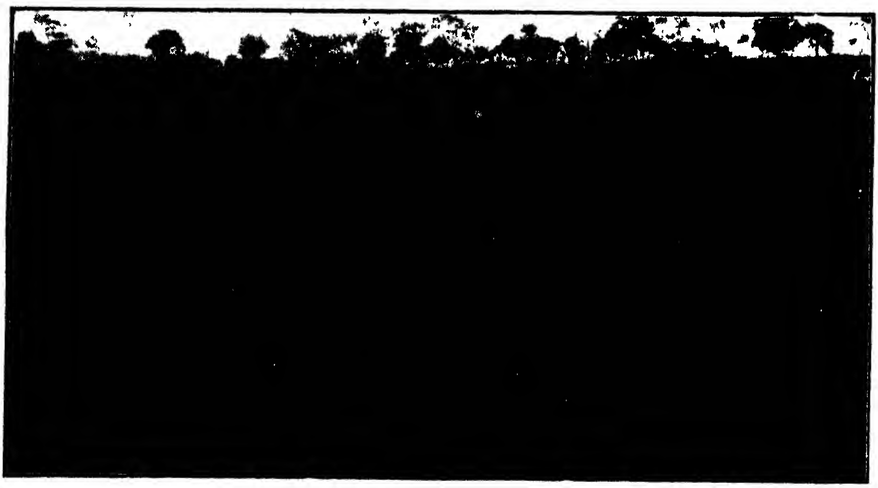


Fig. 5.—The effect of Top-dressing.
On the right of the picture will be seen two black arrows, indicating two lines in the paddock. The strip between the arrows was not top-dressed, while outside that strip superphosphate was applied at 140 lb. per acre. Photograph taken in October, 1924.

of 2 lb. per acre. The clover did not make much headway until early in 1924, when it was estimated that the area could be stocked continuously for the twelve months at the rate of two sheep per acre without any top

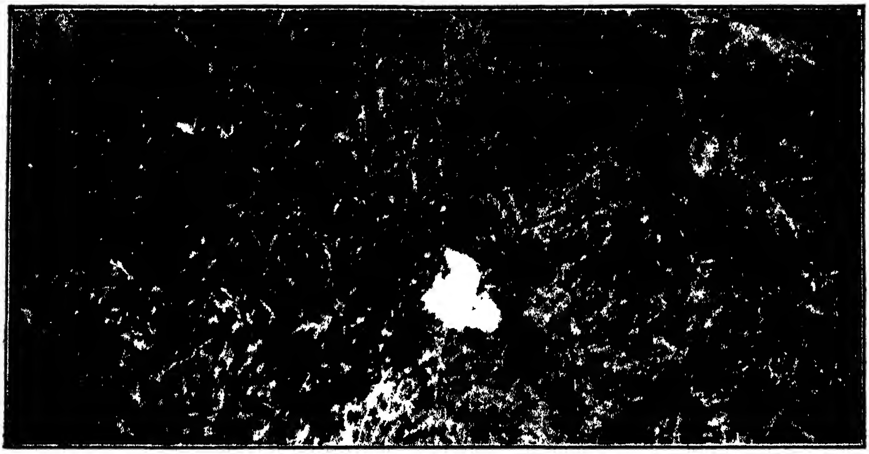


Fig. 6.—Another Comparison.
On the left, Subterranean clover top-dressed with superphosphate at 140 lb. per acre. On the right, no fertiliser was used ; note the weak growth of clover.

Fig. 7.—Top-dressed Perennial Rye and Sheep's Burnet.
Carrying three sheep per acre in October, 1924.

dressing of superphosphate (see Fig. 3). Similarly treated areas, with the addition of 140 lb. of superphosphate per acre, carried three to four sheep per acre.

Sheep have also spread the seed of Subterranean clover into other pastures, and the plants are now well established.

The Value of Subterranean Clover.

This plant is a free seeding annual which buries a large proportion of its seed, thus enabling it to be maintained in a pasture for all time, provided the areas are not overstocked in dry seasons; this procedure enables the plant to develop some seed.

Sheep and cattle do remarkably well on this clover, which will not only fatten them but carry the stock right through the year.

Its period of succulence is mainly from April to the end of December, and provided average winter and spring rains are experienced the clover will make sufficient growth to carry stock on dry feed during late summer and early autumn months.

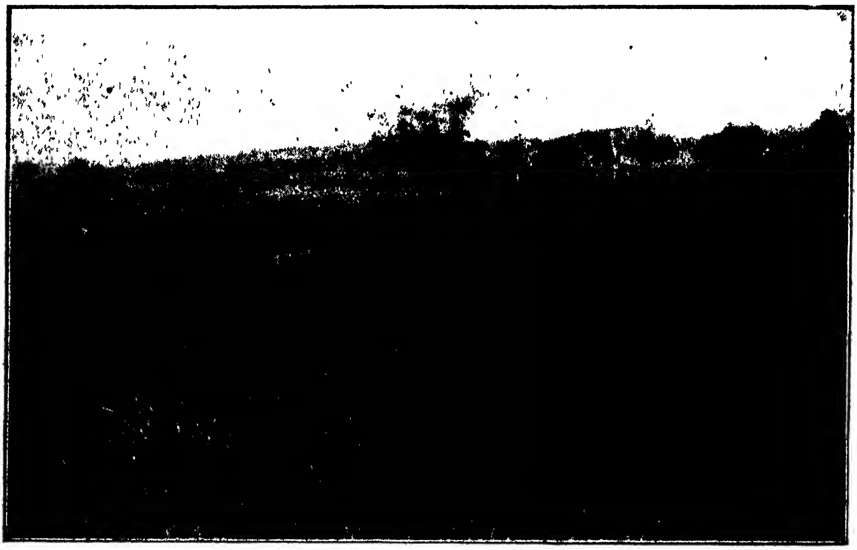


Fig. 8.—The same Paddock as in Fig. 7.
Photograph taken in December, 1924. Note the growth now.

Top-dressing Results.

The 35 acres of Subterranean clover in Figs. 4, 5, and 6, which show top-dressed and unmanured areas, were sown in the autumn of 1921 at the rate of 6 lb. of seed per acre. From May to the beginning of September, 1924, this area carried two sheep per acre, and was then top-dressed with 140 lb. superphosphate per acre and closed up for seed purposes. When the photograph in Fig. 5 was taken on 22nd October, the sheep had been off the area for four weeks. Mr. Prell estimated that the unmanured section would not only carry, but would also fatten, two sheep per acre until March, 1925, while the top-dressed section would do the same for six or more sheep. Fig. 4 clearly demonstrates the remarkable response made by this plant to the

application of superphosphate. The mat of growth in December on the top-dressed plot was one foot deep, whereas on the unmanured section it was only 2 inches.

Moreover, the extra growth on the top-dressed section was not affected by a late frost which occurred during the first week in December, whereas the unmanured section, which was flowering, suffered to some extent, and, in consequence, its seed crop will be somewhat impaired. The top-dressed section had already formed a large quantity of seed and was still flowering, but the thick mat of growth present protected the clover from frost, and no injury resulted.

A special feature of Subterranean clover in this district is that it is giving excellent results on inferior grazing land, and its response to superphosphate under these conditions is most marked.

Fig. 9.—Subterranean Clover choking out Black Thistle.
Three arrows can be seen indicating what remains of thistle.

Prior to planting the clover, this paddock had been continuously cropped for many years, and it was then used as a grazing area and stocked so heavily that it became depleted of all its useful pasturage. The paddock was ploughed early in 1921, and Subterranean clover planted in the autumn. The seed will be harvested in January, and the paddock heavily stocked at the rate of seven or eight sheep per acre for a month or six weeks, in order to clean up the dry feed and allow fresh growth to make headway. Not only will the land be enriched through the growth of this valuable legume, but it will also be improved by the sheeps' droppings.

Subterranean clover should not be heavily stocked until it is well established in a pasture. When well established the clover makes a mass of runners which root freely, thus preventing them from being pulled up in long pieces.

Perennial Rye has also given satisfactory results when top-dressed with superphosphate at the rate of 140 lb. per acre. An area of 50 acres of this grass and Sheep's Burnet planted seven years ago was manured last August and readily responded to the application. In October it was carrying three sheep per acre (see Fig. 7), and showed considerable improvement over surrounding unmanured areas of these same plants growing under otherwise similar conditions.

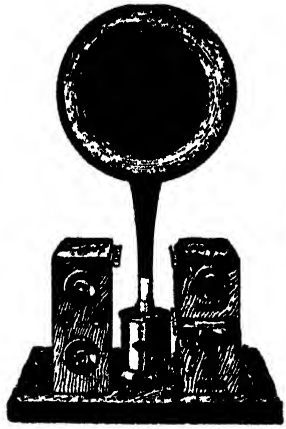
Fig. 10.—A Seed Plot of Toowoomba Canary Grass (*Phalaris bulbosa*).

Fig. 8 is from a photograph taken on 12th December, and gives some indication of the amount of feed present, even when carrying 250 sheep and seventeen bullocks since October. This area of Perennial Rye and Sheep's Burnet was 18 inches high and the feed was extremely bulky.

Fig. 11.—On the left, Toowoomba Canary Grass cultivated and top-dressed; on the right, the same grass without treatment.

Stock exhibit a distinct preference for top-dressed pastures as against untreated ones, the pasturage evidently being more palatable. Superphosphate encourages the growth of clovers and grasses, and the plants remain greener and more succulent than those which do not receive any fertiliser. By remaining green the danger of fire is considerably lessened.

The preference of stock for fertilised pastures could not be better illustrated than by the case of a native pasture paddock of 120 acres, 12 acres of which received a dressing of 140 lb. superphosphate per acre in August, 1924. The sheep are never off this manured section and have the clovers and grasses well eaten down. There is plenty of feed on the unmanured section, but the



animals are evidently obtaining more nourishing feed from the treated areas. Sheep fatten more readily on top-dressed pastures than on untreated areas.

Subterranean Clover Choking out Weeds.

In many parts of this district sorrel (*Rumex acetosella*) is a curse, and is responsible for considerably reducing the carrying capacity of pastures and yields of cultivated crops.

Where this clover has been planted it is dealing with sorrel very effectively by smothering it out. The same remarks apply to thistles and such like weeds; it may also prove of value in bracken fern country.

Fig. 9 shows a few black thistles (*Carduus lanceolatus*) in amongst Subterranean clover. Prior to planting the clover, the thistles were very plentiful on this area, but each year their numbers are decreasing and now only a few spindly plants remain.

Fig. 12.—A Seed Plot of Tall Oat Grass (*Avena ela'ior*).

Other Useful Winter Grasses.

The growth of *Phalaris bulbosa* in the plots which are being retained for seed is over 5 feet in height, and the crowns of the plants are two feet across. Self-sown plants from last season's seed are making good headway; 4 lb. of seed per acre is sufficient to sow an acre.

Tall Oat grass shows the tallest growth of any in the seed plots, many plants being 6 feet in height. This plant also establishes itself readily from seed and is giving promising results; 4 lb. of seed will sow an acre.

Hooker's Fescue while not as bulky as either *Phalaris bulbosa* or Tall Oat, is making good progress. These three grasses are sown in a white pipeclay soil overlying a stiff clay subsoil, and have responded well to cultivation and a top-dressing of 1 cwt. superphosphate given last August.

Wimmera Rye grass is a rapid growing annual and does well in the poorer class land of this district. If during the autumn 4 lb. of Wimmera Rye

and 1 lb. of Subterranean clover are cultivated in the hilly land they will be found a marked improvement, in that they will choke out useless weeds and grasses such as Rat Tail Fescue and Barley grass, the seeds of which cause considerable damage to sheep (especially lambs) during the summer months.

Climatic Conditions.

The average annual rainfall for the past twenty years at Gundowringa is 26·76 inches. The rainfall for 1924 was 26½ inches, so that the past year has only been an average one.

Fig. 13.—Subterranean Clover.
On the left, unmanured; on the right, top-dressed with superphosphate at the rate of 140 lb. per acre.

The work is being conducted at an elevation of 3,000 feet, early frosts being experienced in April; in most years only occasional frosts are experienced after September. A fairly heavy frost occurred during the first week of December, 1924.

Invariably there are three falls of snow per year in the locality, and a heavy fall has been known to remain on the ground for six days.

Conclusion.

The marked success of Subterranean clover should be welcomed by all graziers in this district, also the fact that the best of our winter grasses are giving such satisfactory results.

Top-dressing with superphosphate at the rate of 1 to 1½ cwt. per acre gives such remarkable results on both introduced grasses and clovers, and so improves the palatability of the best of our native grasses and introduced clovers in native pasture areas, that its use should become widespread.

The Cherry in New South Wales.

A Discussion of some of the Problems.

W. H. BROWN. Editor of Publications.

As in the case of every other crop, cherry-growing has its own peculiar problems. Climate and soil requirements have long been fairly well defined, but the plant materials that will furnish the most profitable trees and hasten bearing age are still the subjects of keen discussion. It would appear that as to certain of these problems many experienced growers are to-day tending towards certain definite lines of thought, and the present moment is therefore one of considerable interest.

A Retrospect.

In a measure the history of cherry-growing in this State has been the history of growers' opinions on the question of the best root stock. Sixty years ago and more only one class of stock was in use—Kentish—and on it were planted the whole (or practically the whole) of the cherry trees of that day. The best of soils—deep red basaltic loams—were chiefly used for the purpose, and many trees on that type of soil remain to this day, carrying good crops and showing every promise of lasting almost indefinitely. In the town of Orange may be seen a truly magnificent tree with a height of nearly 30 feet, if not more, and a spread of 40 feet, and in all the older districts can be seen fine trees very nearly as large and as old. Lighter soils were also planted in those early days, though one would judge to-day not so extensively. While trees on these soils never attained the same dimensions, there are still areas—such as that planted by the late Mr. Nicholas Jasprizza at Young—where sixty-year-old trees, 10 feet high and no greater in spread, continue to bear profitably and will do so while a few inches of healthy bark remains to carry the sap.

It may be thirty years ago that the Mazzard variety began to attract attention as a root stock. Its suitability for the lighter soils brought within the sphere of the cherry-grower a class of land that hitherto had not been so favoured for the purpose, and the large vigorous trees produced by the new stock even on light soils suggested they would surely carry heavy crops. Kentish continued to have its followers, but even growers on the heavy soils that undoubtedly are more suitable to Kentish than to Mazzard seem to have been impressed by the size of the trees on the latter stock. In effect the pendulum swung violently toward Mazzard, and scores of acres—perhaps hundreds—were planted on that variety. The discovery that this wholesale use of the newer stock was an error has been an expensive business, for Mazzard has not only proved slow to come into bearing on practically all soils, but excessively slow on many heavy ones. At Orange some beds of

trees have reached sixteen years old without yielding more than nominal crops, and at Young and Uralla quite a number of the newer plantings have been unprofitable at twelve years old. Moreover, trees on Mazzard exhibit a serious tendency to die back after they have borne only a crop or two, and growers are confronted with the position that blocks that have taken years to come to profit are now being thinned out by the unaccountable death of portions or of the whole of several trees per acre.

How they grow at Orange.

The third phase of cherry-growing in New South Wales may be said to be the period of the discovery of these limitations of Mazzard. To-day there is a marked recoil in all the main cherry districts towards the Kentish stock, and in districts which a few years ago were regarded as "Mazzard districts" many growers are now confessing a decided preference for the older sort.

It is one of the purposes of this article to warn growers against allowing themselves to be carried too far in the other direction. A series of visits to three of the principal cherry districts in New South Wales within the past few weeks, and many conversations with different growers have suggested that neither Kentish nor Mazzard is a complete answer to all the requirements of cherry-growers, but that each stock has its utility. In the course of the inquiry opportunity was afforded for a valued contact with Mr. W. le Gay Brereton, Assistant Fruit Expert, Mr. S. A. Thornell, Orchard Inspector at Young, and Mr. D. D.

Atkins, Orchard Inspector at Orange, and it is to them in large measure that growers are indebted for the observations and suggestions in the following pages.

The Cherry Districts of New South Wales.

Cherry production in New South Wales is essentially connected with three districts, well known for the fertility of their soils, for good, reliable rainfalls, and for moderate temperatures. The latter two of these essentials are secured of course by elevation, the principal cherry districts being well above sea-level. Orange and Uralla each approximate to 3,300 feet high, and Young at nearly 1,500 feet high is somewhat warmer but is able to serve the market as an early district.

Orange, with something like 1,250 acres under trees (according to the Government Statistician), is most extensively interested in the business, but Young with just over 900 acres is not far behind, and Uralla has just over 200 acres. In recent years two or three new localities have been giving some attention to the crop, being able to place their fruit on the market a few days even before Young. Camden and Thirlmere may be mentioned as prominent in this direction, though their total areas are not appreciable.

So defined are the requirements of the cherry tree in respect of soil, that in all three of the older districts the area over which the crop is grown is strictly limited. At Orange, for instance, the "cherry district" begins a few miles on the eastern side of Millthorpe, and extends only to Borenore on the Molong line and Mullion Creek on the main western line—a total length of under 30 miles—and the belt is not much more than 10 miles wide. At Young, the strip of suitable country is still smaller—comprising a ridge 8 miles wide and about 14 miles long, outside of which wheat-growing commands attention on the cultivable land.

"High, Dry, and Deep."

In this terse formula, Mr. J. H. Yeomans of Uralla expressed the soil requirements of the cherry. Both red basaltic loams and light granitic soils are suitable, but drainage is an essential under all conditions. Mr. Yeomans particularly drew attention to the manner in which both trees and crops in his orchard indicated the greater suitability of high ground. Underground drainage is also essential, and a friable subsoil is generally insisted on by the older growers. At Orange one grower pointed to a group of trees in his orchard that had a much less vigorous appearance than others round it and remarked that "the subsoil is a stiffish clay just there, which evidently does not suit them so well." At Young, where the suitable soils range from heavy chocolate reds to white granitic sandy loams, Mr. Thornell remarked that either of these with a free subsoil produces excellent quality fruit. Heavy soils necessarily tend to produce large vigorous trees, which are longer in coming into bearing, while on the lighter soils the trees come rather sooner to profit, and it is generally claimed that the fruit is of finer texture and flavour though the crop may not be so heavy.

"When planting heavy cropping varieties, put them on the heavy land, and the lighter bearers on the lighter soils," said a Young grower of long experience.

The longevity of the trees has also some relation to the soil. It is quite true that on a good many acres of somewhat lightish soils are to be found trees sixty years old, but for the most part the oldest trees are found on heavy soils, and the deduction seems to be reasonable, as Mr. Yeomans remarked, that "only a strong soil would stand to old trees like these." There are admirers of Mazzard stock, who claim the same longevity for it as for Kentish, and it may be that on the soils for which Mazzard is properly adapted the trees will carry as well at three-score years and more as do Kentish stocks on heavy soils.

The cultivation of the soil throughout the life of the orchard has an important connection with the choice of the soil. The farmer who proposes to plant on light soils should make up his mind at the outset to the necessity for maintaining the humus content of the soil throughout the life of the orchard. The heavy soils may be kept in quite good heart by a couple of ploughings in the year (one of which is likely to turn under a good crop of weeds) and perhaps a couple of strokes of the cultivator, but in all three districts named above—perhaps notably at Young—the necessity for better methods of soil management is apparent on the lighter soils. Orchards are to be seen where the humus content of the soil has been burnt out by regular ploughing, and an impoverished condition and a disposition to set hard after every rain is the result. It is evident that growers should enter upon the business with the recognition that the maintenance of a proper amount of vegetable matter in the soil is an aspect of things they cannot afford to neglect. There may be more to say upon the subject later on, but the warning in relation to light soils in particular is not out of place here.

Planting a Young Orchard.

Deep and thorough working of the soil as a preliminary to planting should go without saying. The Uralla grower, Mr. Yeomans, summarised his advice thus: "Were I to plant a cherry orchard again, I would select the richest basaltic soil available, providing it was high and dry and deep, with a good friable subsoil. I would force the trees as much as possible from the very first by intense cultivation, and I would use the pruning-knife as little as possible, only paying attention to the framework of the tree with a view to its future bearing."

Mr. E. A. Neil, located on lighter soil in the same district, put his experience thus: "It is better to wait a year and to plant in thoroughly prepared land than to hurry and to 'stick' them in roughly. Some of the trees here never did well, and when they were taken up to make room for new trees it was apparent that shallow planting was the trouble—those in charge of the work had been in a hurry and the result was the trees ultimately had to come out. The year they were planted the summer was a wet one, and the winter was

dry and early, and the soil would no doubt be very hard at the planting time. It is to be feared the trees did not get the root room they should have had."

Mr. S. A. Thornell, Orchard Inspector at Young, on the other hand, insisted on the importance of using the best material for the making of the young plant itself. He touched upon three vexed problems—the use of seedlings or of suckers for planting out, the value of the grower raising his own stocks and himself selecting the budding or grafting wood of the correct variety, and the suitability of the Kentish and Mazzard stocks for different types of soils.

Seedlings or Suckers.

As touching the first of these three issues, it may be admitted that seedlings probably produce the better plants in the young stage. Mr. L. Thompson, an Orange grower with an interest in the nursery side, dug up a couple of seedlings that exhibited a fine root development, one feature being the depth they went down into the subsoil. Such a deep rooting system is rarely if ever seen on a nursery tree from a sucker. But the cherry seed is most difficult to germinate, and a large number must be planted and much attention must be given them to get sufficient to plant any reasonable area.

Suckers, *per contra*, are easily procured, for most of the trees in an average orchard throw up plenty—far too many in the case of the Kentish, the free suckering habit of that stock being one of its disadvantages, according to many growers. From the mass of suckers available, it is important that only those shall be used for planting out that exhibit a well developed and fibrous root system. Many suckers when pulled up have one or two broken pieces of root the distribution of which round the main stem does not favour a well formed tree, while the limited supply of small feeding roots suggest that the tree will be very slow in getting a start. The sucker shown in the accompanying illustration (selected by Mr. D. D. Atkins at Orange) presents a desirable root development, though the top could perhaps be better. To get a number of suckers as well rooted would mean no doubt a good deal of labour, and would probably involve discarding a good many inferior specimens, but he who plants a tree plants for a generation, and no amount of trouble that will ensure the very best tree in every respect should be regarded as wasted.

"You want to be sure of getting well rooted suckers," said one who had an interest in a recent planting of 80 acres at Young, "and to let them make a good growth before working them at all. It is a mistake to cut a sucker back when planting it." If the sucker has more than one leader when selected it must be reduced to a single stem, and some growers allow this single stem to remain uncut for a time after planting, but both Mr. Brereton and Mr. Thornell consider it better to head the rod back when planting, the new sappy growth being surer for budding or grafting purposes.

It is usually necessary also to cut away some of the roots; the cut should not be made so that the cut area of the root lies upward, as in that position water

may rest on the upper side and part of the root will then rot away. If the root pruning is done so that the cut area faces downwards there is a better prospect of healthy roots developing from the tip.

A Sucker that should make a Good Tree.

If desired, the sucker can be bench-grafted at this stage, but probably the best results are obtained by planting out in June in the ordinary way, the roots being distributed evenly and the soil packed firmly round the little tree.

Planting-out Problems.

Mr. Thornell remarked that there is a decided advantage in planting fairly early, as the plant makes root growth even when the tree is otherwise dormant. He observed that the roots of some suckers that had been planted out made 2 inches of growth last winter, though there was no top growth whatever—a great advantage in getting the tree well established.

Emphasis was also thrown on the results obtained by planting the suckers in their permanent positions in the orchard at once. Planting in the nursery and transplanting to the orchard subsequently means a disturbance of the tree that causes loss of time. It is true that setting the trees out in their permanent positions involves extra work in ploughing the whole orchard area, but then a good deal of work that is necessary in a nursery is saved, and so also is the labour of transplanting from the nursery to the field. One orchard in the Young district was pointed out where, though the suckers had only been planted out in June, 1921, and worked in August, 1922, there were a few fruit on the trees this year, and the growth was twice that exhibited by

nursery trees near at hand planted out in the same year. Mr. Thornell has taken a good deal of interest in advising this particular grower, and the growth obtained was quite sufficient testimony to the success of the methods adopted.

The main objection to this method of planting out at once is the possibility that under adverse conditions—particularly in a dry season—a number of trees may die off, and their places have to be refilled, with the result that the block will be an uneven one. This is more likely to happen in a dry district, though Young (drier than most of the cherry districts) is the place from which the advice actually comes, and where the method has been adopted with some success. "There is little danger of a well-rooted Kentish sucker dying if planted in its permanent position," says Mr. Thornell.

As a good strike from the suckers is not invariably obtained, it will be necessary to provide for refills by planting a certain number of suckers under nursery conditions—say in rows 3 feet apart and from 1 to 2 feet apart in the rows. These should receive careful cultivation throughout the year, more especially in February, which over a good part of the State is the driest and severest part of the year.

In the case of young trees in their permanent positions, it should, in an average season, be possible to bud in the summer following planting, December and March being usually the best months. Should the bud fail to take, the tree can be worked by grafting in the following August.

The height at which budding is done depends to some extent on the district. At Young, where the conditions are hotter than in any other cherry district, it is especially important that budding be done close to the ground to ensure shade for the trunk of the tree, otherwise "sun scald" may occur.

Forming the Young Trees.

For the graft, wood should be selected that has three well distributed healthy buds. Some growers prefer to allow these buds to make growth and to form the tree, it being contended that they may save future work in heading back for that season; should only one make a strong growth the weaker ones may be entirely removed and the strong one pinched back to form a head. It is more usual, however, to cut the graft back when working, so as to get one good shoot from which the three buds can be obtained that are to form the head.

The most successful graft for cherries appears to be that known as "whip and tongue." The stock should be cut back with a clean slice to about 9 inches above the ground, and a tongue cut in the wood. The graft should be cut with a similar slice, and a tongue cut in it also, and the two fitted together. To cover the graft Mr. Thornell advocates a waxed paper that any orchardist can easily make for himself, viz., 1 lb. beeswax 1 lb. resin, and ½ lb. fat (or ¼ lb. lard), boiled together and then painted on brown paper. When dry, the paper is cut into strips an inch wide,

and is wound round the graft, and the end pressed down till it adheres. It will be found to hold quite well until the swelling graft itself bursts the paper.

From the graft, there should be a growth of up to 3 feet in the season following, and the first season's training will consist of shortening each limb back. In the following year about one-third of the new growth should be removed, and six leaders should be obtained. In the third season by the same treatment twelve leaders can generally be obtained, and at that stage it may be reckoned that the framework of the tree has been formed. It is better to have a number of small leaders on the cherry rather than a few larger ones, as the fruit is usually of better quality, the crop heavier, and harvesting easier if the branches are many. Winter spraying to keep the tree clean may be needed, and the grower must be prepared to fight the cherry slug vigorously, two and even three summer sprayings with arsenate of lead being necessary in certain districts. Beyond a little thinning to remove any cross limbs, the tree should henceforth require practically no attention, at any rate until it comes into cropping. The amount of pruning a cherry tree should receive after it comes into crop is much discussed, and is generally considered to depend somewhat upon the variety, but to that aspect of the subject we may return later on.

Every Grower his own Nurseryman.

Without exception growers recommend that those who intend to go in for cherries or to extend their areas should themselves select the suckers for their trees, and work them over to the desired varieties with buds or grafting wood selected from trees known to bear fruit of good quality in payable quantities.

The first advantage to the grower who is his own nurseryman is that his trees are much cheaper than those bought at £5 to £10 per 100. Even more important in its ultimate influence on the profits from the venture is the fact that the suckers can be selected from the right stock, and from trees growing under similar climatic conditions. On one plantation at Young an opportunity was afforded of comparing three-year-old trees from suckers that the grower had himself selected in his own district and subsequently grafted, with worked trees supplied from another district. The latter were not half the size of the former. Acclimatisation may be a factor of importance, especially in a district like Young where imported trees are likely to find the conditions a bit warmer than in the district from which they came.

The third advantage attached to the grower being his own nurseryman is that he is able to ensure that the budding is done from the correct variety. Many a cherry-grower in this State points ruefully to blocks of trees on which valuable years were wasted before the crop made it manifest that an unsuitable—perhaps an undesirable—variety had been supplied. The likelihood of that occurring where the nursery work is done by the grower himself is very small. Moreover, there are wide variations in the cropping habit

of individual trees, some being good consistent bearers, and others irregular and even unprofitable. At Young it was remarked that early Lyons is conspicuous in this respect, good and bad croppers occurring frequently under apparently uniform conditions.

On the same tree, too, there can sometimes be seen branches that bear well and others that do not. At Uralla one tree was pointed out that carried on certain apparently healthy branches a heavy crop and few leaves and other branches which were heavy in leaf and light in fruit. Manifestly budding wood taken from branches that are cropping well is more likely to produce profitable trees than wood taken from poor trees or branches. These are considerations to which the intending grower is likely to give attention if he is selecting his own wood, whether in his own or in a neighbour's orchard.

The Question of Root Stocks.

Involved at an early stage in the planting of an orchard is, of course, the vexed question of the root stock. The scope of the problem was indicated in the opening paragraphs of this article, but as the most discussed of all issues connected with cherry-growing it cannot be so summarily dismissed.

The importance of the relative merits and limitations of the two leading stocks in this State can hardly be exaggerated, and one has only to visit a few orchards where mistakes have been made to acquire a sense of this. Beds of trees can be pointed to where the proper order has been absolutely reversed by both stocks being planted on the wrong soils. In one orchard at Young, large Mazzard trees 12 years old, though on one of the best patches of soil in the district, were only just coming to profit, and already several trees were dying out, while near at hand another grower, on good soil, had worked all his trees on Kentish, and was getting heavy crops from smaller trees planted closer together. Another orchard at Young furnished a glaring example of how not to do it, though it might have been supposed that the grower would have had every advantage in the way of experience and well informed and well disposed neighbours. It would seem reasonable to conclude that few errors of this kind will be made in the future in view of the extensive experience that has now been obtained.

Kentish for Heavier Soils.

As already stated, the earliest plantings in the State appear all, or nearly all, to have been on the Kentish variety, and in the presence of the fine individual trees to be seen in all three principal districts the longevity of the stock is beyond argument. Nor are such long lived trees confined to the heavy soils on which they flourish 25 feet and more in height and proportionately broad. On lighter soils both at Young and at Orange much smaller trees may be found on this stock, which, though not exhibiting anything like such size, are profitable still at sixty years old.

Kentish also exhibits considerable capacity for renewal. At Uralla and at Orange trees thirty to sixty years old can be pointed out which (having

been attacked by white ants in some cases and gumming in others) were cut back to the stump with a view to their being grubbed out, but they manifested so much root power that the owners grafted newer varieties on to them, with the result they are still (as much as ten and twelve years later) cropping profitably, with every prospect of continuing to do so for years to come.

Compared with other root stocks, this variety exhibits considerable capacity for drought resistance. In the Young district, where the rainfall is lighter than in most of the recognised cherry districts, the losses of trees on Kentish stocks in the droughts of recent years at any rate have been far smaller than those of trees on Mazzard stocks. The reasons for the phenomena may admit of considerable discussion but the facts are undoubted.

The Habit of the Kentish Stock.

The outstanding limitation of the Kentish stock is its small root system. On the heavy types of soil this is of small consequence, the strength of the ground itself encouraging the feeding roots and producing large trees, but on light soils the poor root habit is so marked that only small trees are formed, and these have such a slender hold upon the ground that in severe wind and rain storms it becomes too common a thing to find full-grown apparently sturdy trees blown over.

Kentish stock favours quick development, and the trees on it come early to profit, good crops at five and six years old being not uncommon, and though the trees may rarely carry such large crops as those often attributed to Mazzard trees, they are more consistent.

By some growers Kentish is considered to yield better quality fruit, and certainly it seems to favour size, but similar claims are made by some Mazzard growers, and the indications are that soil has no small influence on these characters, fineness in texture and quality being perhaps associated with well grown crops on light soils, while size is more associated with the heavy soils.

The Kentish stock is identifiable by a small sharp-pointed dark-coloured leaf, with a rather glossy surface, and by a reddish colour of the bark as the wood gets a bit older.

Where Mazzard is Profitable.

The features of the Mazzard stock are its vigorous root habit and the large handsome trees it produces, even on light soils. Its exceedingly slow maturity has already been mentioned, and though that may be corrected in a measure by planting on light soils, even there ten years and more are required to bring a tree to profitable cropping. On the heavier soils the Mazzard stock expends itself in the production of an expansive growthy tree, and fourteen to sixteen years is not an uncommon age before a tree starts fruiting. This is so marked that none but a few of the most ardent admirers of Mazzard will advocate its use on heavy land. At Orange, which we were told was largely "a Mazzard district" because the cooler conditions there favoured that stock, the swing back of opinion to Kentish on all but the light soils is most marked, growers confining their support of Mazzard to conditions that make its vigorous root system a definite necessity.

A Spray of the Mazzard Variety.

The cases may be mentioned of one Young grower whose Mazzard trees at twelve years old are just coming to bearing, of another who has had one good crop from trees eighteen years old, and of a third who has waited ten or twelve years and then has found the trees dying back. At Orange may be mentioned a block of St. Margarets on Mazzard which at sixteen years old has this season yielded the first good crop, a sixteen-year-old block in

another orchard that has not yet cropped, and a block of St. Margarets on Mazzard in the same orchard which in sixteen years has given three crops—the first fourteen boxes per tree, the second eight boxes, and the third twenty boxes.

This stock has the further limitation that on almost all classes of soils, and without any definite relation to variety, it is no uncommon thing to see several trees in a plantation dying back branch by branch. This habit is often connected by growers with the condition known as "sour sap," but sour sap is not invariably present, though several growers testified in conversation that it is not the roots that die out—in fact, often the roots when uncovered are found quite healthy while the top of the tree

Mahaleb.

is almost dead. The phenomenon requires a good deal of study, for while Mazzard generally lasts longer on light soils than on heavy, there are orchards where the dying off described occurs under apparently the most suitable soil conditions. The seriousness to growers of the loss of trees after they have waited ten, twelve, and even fifteen years for returns does not need to be laboured.

It has been the custom to consider that certain varieties should be worked on Mazzard only, but sufficient evidence is forthcoming now to indicate that that at any rate does not apply to all conditions. Early Lyons, for instance, usually tends to over-crop on Kentish, and comes so early into bearing as to stunt growth, but it is not invariably so. "I would plant Kentish only—Lyons and all," said an Orange grower, and another (located on strong

soil) remarked that he had Early Lyons on Kentish and they were cropping quite satisfactorily. Moreover, during our visits to cherry districts we came upon Early Lyons trees showing good growth on Kentish stock, the soil being good and climatic conditions mild.

Growers find large trees are not an unqualified advantage. They are difficult to harvest, and pickers are apt to leave untouched the fruit on the tops of the branches that are hard to reach. In any case long branches are slow to pick. "You can pick two cases on the ground to one on the ladder," is a recognised fact, so that when the crop is coming rapidly to hand, it is a consideration to have smallish trees with their crops within easy reach.

The Mazzard sucker is characterised by a broader and larger leaf than the Kentish, by the serrated edges of the leaf and by a duller colour. The difference between the two plants is often difficult to determine, however, as they vary much in size according to soil and other conditions.

The Mahaleb Stock.

One other stock is used in this State—Mahaleb—but its utility is reserved for one variety of cherry, Early Purple Guigne. In fact, "E.P.G.," as it is often called, should be grown on nothing else, neither Mazzard nor Kentish suiting it so well under any conditions so far as we could learn. Mahaleb has a marked stunting effect on all varieties worked on it, and in one orchard we came upon several varieties tried on it—all with results that confirmed the general opinion.

Mahaleb has a much smaller leaf than either of the other more favoured stocks, and a lighter colour.

A Summary.

Our discussion of the two stocks will suggest to readers that Kentish should be used on all the heavier types of soils and Mazzard on the light ones only. Where the soil conditions seem to favour the formation by Kentish of small trees, the grower can with safety plant a little closer together, compensating himself for the smaller trees compared with the Mazzards by having more to the acre.

Bearing in mind all that we have said in these pages as to the relationship of stocks and soils, there are certain varieties that, all other things being favourable, show a preference for certain stocks. These may be indicated in general terms as follows:—

On Kentish stock—Florence, St. Margaret, Noble, Black Republican, Biggareau Pellissies.

On Mazzard stock—Early Lyons, Eagle Seedling, Bedford's Prolific.

On Mahaleb stock—Early Purple Guigne.

A number of varieties are impartial as to the stocks they like, Burgdorf Seedling and Werder's Early being notable in this regard.

It will interest readers to add that the experience with Mazzard in North America seems to have been almost as unsatisfactory as in this State. As

a stock, Kentish receives no mention in the history of the cherry in the United States or Canada, and until some forty years ago Mazzard seems to have been universally used. In 1850 Mahaleb began to attract attention as a stock, and in a few years it had quite displaced Mazzard in favour, so that now 95 per cent. of the trees in that country are on Mahaleb. It is admitted that Mazzard makes the better union and the bigger and thriftier, longer lived and more productive trees, but Mahaleb has the effect of stunting the tree (and presumably of bringing it earlier into bearing), of being more easily budded, of being more hardy, withstanding greater heat and cold, and being less subject to aphis, mildew, and shot-hole fungus in the nursery.

(*To be continued.*)

Return of Infectious Diseases Reported in December.

The following is the return of outbreaks of the more important infectious diseases reported during the month of December, 1924:—

Anthrax	4
Contagious pneumonia of swine	3
Pleuro-pneumonia contagiosa	Nil.
Piroplasmosis (tick fever)	,,
Swine fever	,,

—Max Henry, Chief Veterinary Surgeon.

Another Bad Weed.

During November and December another bad weed, *Echium Italicum* (Italian Bugloss), made its appearance near Young, and also in the Corowa district. The new weed is a native of Italy, Spain, France, Transylvania, Greece, and Eastern Caucasus. It is adventive in Arabia, Palestine and Syria. According to a recent report it is spreading in South Australia.

It is closely allied to Paterson's Curse, *Echium plantagineum*, from which however, it can be readily distinguished by its hoary and yellowish appearance, more upright habit, and white flowers. It is also more hispid, being covered with short prickly bristles which make it objectionable to man and beast. In fact, it is so well protected that grazing animals avoid it as much as possible. It is of no economic value and is quite useless. It is a very strong grower, and on rich land attains a height of over 5 feet.

As it possesses all the bad characters of a noxious weed, farmers and land owners should be on the watch for it, for if allowed to spread it may become a greater menace to crops and pastures than Paterson's Curse.

It is a biennial, and its only means of reproduction is by seed. Therefore the best way to deal with it is to prevent seed production by destroying it before the flowers appear. Plants that have gone to seed should be carefully cut and burned, and seedling plants watched for and destroyed before they mature.—W. F. Blakely, National Herbarium, Botanic Gardens.

The Training and Pruning of the Sultana Vine.

GERALD W. BEVERLEY, Fruit Instructor.

In dealing with this variety of vine, one must know that it is one of the most delicate of all the vine family, and is more liable to disease than almost any other vine.

For many years after its introduction into this country fifty four years ago, by Dr. Schomburgh, of South Australia, it bore no fruit. To quote Mr. Quinn, the Horticultural Instructor of South Australia and one of the ablest horticulturists Australia possesses, "at that time there was no regular or recognised style of pruning for the many different varieties of wine grapes that were planted in South Australia, and the credit of introducing the first organised system of pruning into South Australia is accorded to the late Sir Samuel Davenport. This worthy gentleman introduced into the colony a number of Frenchmen who were known by the name of 'vinedressers, and from their experience of the winter cutting back of vines of the various wine varieties which were introduced into that State has developed the present style of pruning that has proved so successful in the various large winemaking centres."

For many years, therefore, it is safe to conclude that the sultana, being of an almost unknown variety in France, was in all probability hard pruned back to spurs, and so remained a complete mystery and was regarded as a barren vine.

In the year 1894, the South Australian Government, intent on assisting and developing the industry, brought over from Algiers the present Director of Agriculture in South Australia, Professor Perkins, and to him is attributed the honor of being the first to find out that the sultana bore its fruit on second year wood, and after several years of experimenting this fact has been definitely established.

Different styles of long pruning have at various times been evolved, and the style which is usually adopted at present, that of leaving six rods with an equal number of spurs, is generally known as the Lankaster system, being named after Mr. T. Lankaster, of Mildura, who was the first to adopt it.

Mr. Quinn further states that "the system of pruning the sultana has evolved absolutely out of practical experiences on the River Murray. It is unknown elsewhere." It would be interesting, however, to know what system of pruning is used in Persia and Asia Minor where the sultana is grown in large quantities.

Having thus given a faint outline of the history of this particular vine, it remains to detail the methods by which, after long years of experience by many prominent growers of Victoria and South Australia, this variety has been known to produce up to four and a half tons of dried fruit per acre.

Selection of the Original Cuttings is Essential.

To begin with, I would strongly advise any grower desirous of establishing a first class heavy bearing vineyard of sultanas to be most particular in the selection of the cuttings that he plants. Take none but hard, white or light brown, close-jointed cuttings, from the immediate base of a well grown cane, which in turn has been selected from a vine that has borne heavy and consistent crops of good quality grapes.

Avoid making cuttings from sappy or long-jointed canes, or from laterals. The importance of this point cannot be too strongly stressed, and I have proved to my own entire satisfaction, after many years of experimenting, that on the first selection of cuttings will follow the ultimate result of heavy and consistent bearing.

Cuttings taken from vines which have never borne a crop of grapes, or from vines showing heavy and rampant wood growth, should never be selected, for although these cuttings will grow vines that will bear fruit it is in most limited amounts, and the vines, although making strong growth and large frames, continue the characteristics of their parent stock and do not yield good crops. Nor does heavy manuring seem materially to alter their habits.

Far too little attention has been given to this point, and some years ago when I was asked to inspect some of the sultana vineyards on the Swan River in West Australia, which I was told would not bear crops like those obtained on the Murray River Settlements, I found out by questioning, that my theory that the vines in question had been made from immature cuttings was the correct solution of their poor crops. I have on more than one occasion stopped a man from planting cuttings made from vines that had themselves only been planted the previous year. How could anyone hope to establish a heavy bearing vineyard under such conditions? If you breed from live stock, do you select your young and immature animals, or do you mate those of well-known and tried capabilities, either for milking or for butter test? If a man wants to obtain a special laying strain of fowls, does he take the eggs from any mongrel breed, or does he select his eggs from a heavy laying strain? Why do not the same reasons apply to plant life? The fact is they do apply, and it is becoming more generally recognised every year. However, to get back to the sultana.

Planting Out.

In planting a block, I would recommend the thorough working up of the land to as great a depth as possible, and after the pegging out has been done, *planting the cutting where you want it to grow permanently*. From experiments I have conducted, I have found that my best results were obtained when I made the cuttings from well ripened wood (about the end of July),

and I obtained a far higher percentage of strikes than from those made earlier or later in the season. Some growers advocate "pitting" the cuttings after they are made, and leaving them to sweat until the buds swell. This practice is generally followed, I think, because of the rush of work at that time, and the mode of tying in bundles and burying is the quicker means of disposing of the cuttings. I would advocate, however, planting of the cutting in its permanent position without pitting, and also would run furrows and place in these furrows the cuttings it was desired to keep in the nursery rows, completely covering the cutting, or at most only leaving one bud out of the ground.

Tramp the soil along the cuttings as the trenches are filled, and then run the water down a furrow alongside so as to close in any interstices and prevent the air from drying them out. If this is done the result should be 100 per cent. strike.

Fig. 1.—A Young Vine.

On the left, young vine cut back hard ; on the right, young vine that has made strong growth, but not good enough to take up to the wire.

If the cuttings are "pitted" first, then many of the tender rootlets that callous over the end of the cutting are broken off in lifting, and the cutting has to reform these rootlets before the buds will throw out new growth. Many buds are also sacrificed, but if the cutting is planted in its permanent position the callousing throws out its threadlike roots and these penetrate to a great depth and establish the vine in such a manner as is not possible if it is planted out as a year-old vine.

I think it has been proved beyond all manner of doubt that a vine grown from a cutting will in four years beat a rooted vine planted at the same time out of sight, and I have proved to my own satisfaction that they will bear heavier and more consistent crops, and this after many years of experience with both.

The first year after planting it is usual to cut back the vine to two eyes and the shoulder bud (see Fig. 1), but if the vine has made very strong or abnormal growth it is not wise to do so, and the strength of the individual vine should be taken into consideration. If a strong growing vine is cut back too hard, nothing is gained thereby, and it is only the cause of a number of strong suckers being thrown out from the dormant buds, either

just above or very often below the surface of the ground. The necessary cutting off of these canes leaves wounds on the stem of the vine near the surface, which might easily be avoided by a little discrimination at the time of pruning.

It is often advisable to leave the cane long enough to tie to the first wire the trellis, and if the vine has not made sufficient growth for that, but is

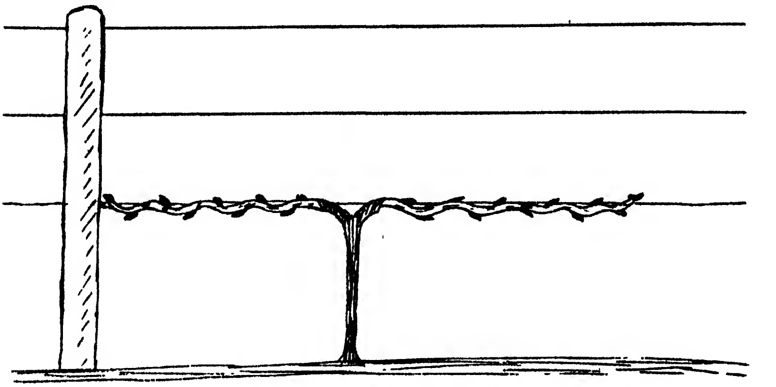


Fig. 2.—The Second Season.
Showing the pruning where the vine was taken up to the wire the first year after planting.

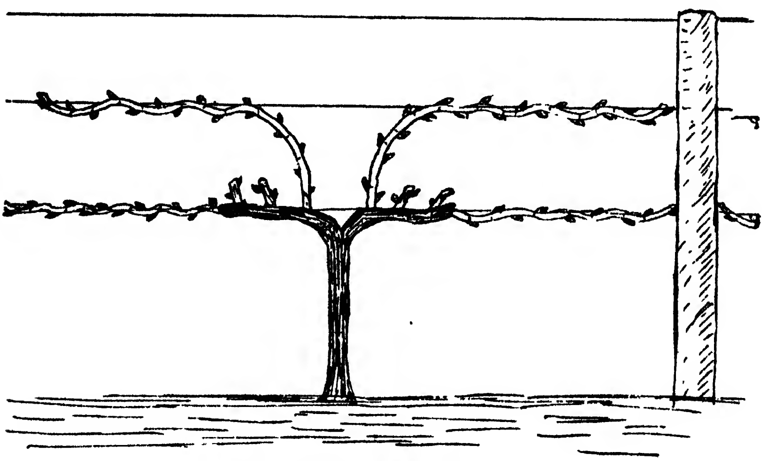


Fig. 3.—The Third Season's Pruning.
Showing four rods with renewal spurs.

too strong to cut back hard to two eyes, then rather leave four or even six buds, because the following season the top buds usually burst out first and commence to grow, and the sap is thereby drawn away from the lower buds, with the result that the grower will not be troubled with the strong growth of suckers, that would invariably be the case in the event of hard cutting.

Pruning in Subsequent Seasons.

The second year of the vine, the pruning is to leave two good rods, well twisted on to the first wire, which is usually run at a distance of 2 feet 6 inches from the ground, and on this main wire the crown or main arms of the vine are permanently established (see Fig. 2).

The third year of the vine it is usually quite capable of carrying four rods with additional spurs, from which the following season's fruit canes will spring (see Fig. 3).

The fourth year, six rods with corresponding spurs may be left, and with very rare exceptions it will be found inadvisable to leave more than this number. I have found that six selected rods will develop better bunches than if more rods are left, and in preference to leaving a greater number I would lengthen those rods that are chosen. Discrimination must always be used in pruning, and the individual strength of the vine must be considered.

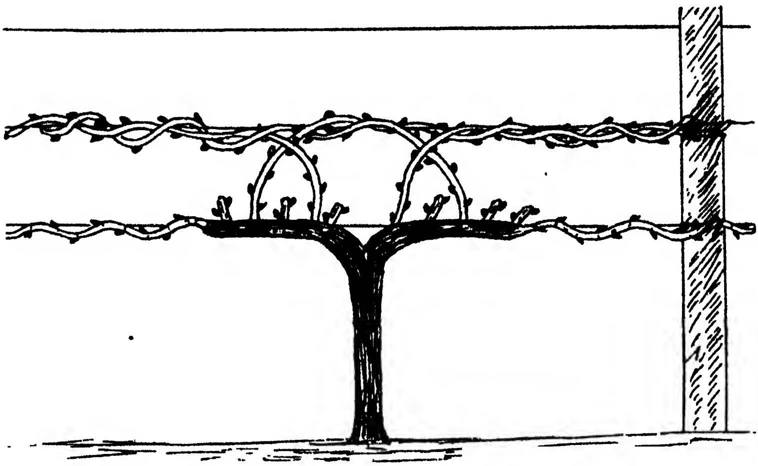


Fig. 4,—The Fourth Season's Pruning.
Note the interlacing of the canes and the top wire to take the new season's foliage.

A slight topping of the shoots before the fruit bunch flowers, and when the shoots are about 15 inches long, will be found of great assistance in making the bunches set, and also in giving larger bunches of fruit, while on vines making heavy growth a cincture cut *just after the fruit has set* will be found of material advantage, giving a far larger crop and also a far larger berry.

The Value of Cincturing.

Experiments conducted over many years at both Mildura and Pyap have convinced me that the cincturing of the sultana can be done with impunity if only a narrow strip is taken out, but the sultana will not stand as severe a cincture as the currant vine, and if it shows any signs of making poor wood growth or canes that show hollow and black at the tips the practice must be

discontinued until the vine renews its vigour. On no account should cincturing be practised on any variety of vine until it is at least three years old, and only then if the growth is strong enough to warrant the operation.

The following figures given in the *Renmark Pioneer* from experiments conducted by Mr. Lyon, Research Officer at Merbein, Victoria, prove the great increase obtained by judicious cincturing of this variety:—

	Cane cincture.			Single cut on the stem.			Double cincture cut on stem.			Uncinctured.		
	Cwt.	qr.	lb.	Cwt.	qr.	lb.	Cwt.	qr.	lb.	Cwt.	qr.	lb.
No. 1	50	0	22	57	0	6	60	1	22	49	0	16
No. 2	54	1	13	63	1	15	70	9	10	46	1	22

From these figures it will be seen that a material increase in the crop can be obtained, and I can from experience say that the operation amply pays for the extra trouble and work involved.

Fig. 5.—A nine-year-old Vine that has been neglected.

What to Retain as Fruiting Canes.

Well ripened and hard wood, with short joints, should be selected for fruiting canes, and all long jointed sappy canes, which are green at the ends or show signs of dying back at the tips, should be cut away. One of the most difficult matters in pruning is to bring back into fruiting an old vine that has been allowed to run out too far from the centre and to make what in many cases is known as a "double-decker."

This occurs through leaving the canes in the first instance too long or untwisted, with the result that the sap runs to the end of the cane and throws out its next season's growth from the end, to the detriment of the buds lower down on the cane.

The following season, the grower who wishes to obtain a crop is compelled to leave rods again at the end of the two-year-old wood, and as there are in all probability no spurs from which to renew canes down on the main arms, the result is a straggling and unsightly vine. Moreover, as the sap has to travel through so much old wood in which the cells are hardened the result is a decrease in crop.

In the case of an old vine that has run away in this manner, drastic methods must be adopted, and the pruner will probably only find a few rods on the main portion of the vine to select from. The old wood must be cleaned right away to restore the vitality, and throw the remaining canes into fruit again by diverting the sap flow direct into the new wood. In some cases it is not possible to leave any spurs for the succeeding year's rods, but by twisting those rods that are left a good shoot will almost invariably break from the base buds of the cane, and this will be the renewal wood for the following season.

The accompanying illustrations (Figs. 5 to 8) show two nine-year-old sultana vines that have run away to the ends of the old wood, and in consequence have fallen off in their yields; but these vines have been

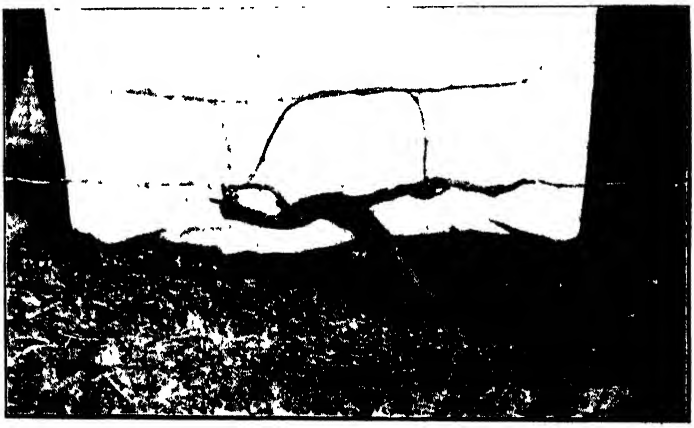


Fig. 6.—How the Vine in Fig. 4 was treated to bring it into bearing again.

completely restored by the method of pruning adopted, and they are this season showing splendid bunches of flower on nearly every bud on the canes that were left.

No greater distance than 15 inches should be allowed between the wires of a trellis, as if a wider space than that is given, it is not possible to get a sufficient bend on the canes to enable the sap to be checked and to cause the cane to break out at every bud. The result is that the following season's wood gets too far away from the crown, unless several good spurs are left for the ensuing season's canes (see Fig. 4). The twisting of the canes is an important point to be maintained in pruning the sultana, and the useful tying up of rods is almost as essential as their selection.

Remember that even a good rod will not throw out from every eye unless it is twisted; but beware of twisting too harshly so as to split the cane.

A short stub of a lateral cane left at the extreme end of the main cane will often hold it in position and save a considerable time in tying up. If a stub is left for this purpose the eyes should be rubbed off it. After the

shoots are so far advanced that the fruit bunch can be easily seen, it is advisable to go over the vines and disbud any of the barren shoots, speciallv those that grow at the extreme end of the cane.

No rod is wanted at the extreme end of the vine, and if these shoots are suppressed the result will be the throwing out of any weaker ones further back on the cane, thus maintaining an even break.

Fig. 7.—Another Vine that has become overgrown.

Fig. 8.—How the Vine in Fig. 6 was pruned to restore it.

If the cuttings are selected in the first place from selected vines, and these methods are followed out, then the grower should look for a return of from 1 to $1\frac{1}{2}$ tons of dried fruit per acre from his vines in the fourth year, and this yield should be maintained and even surpassed as the vines increase in age, provided they are manured after bearing the first heavy crop, as it is

necessary to keep up the stamina of the vines to make them crop with regularity. At the same time, I know of no vine so affected by climatic conditions as the sultana.

Manuring Practice.

A good manure to use for vines is 1 cwt. sulphate or muriate of potash, 2 cwt. superphosphate, 1 cwt. bonedust per acre. If the vines show signs of making poorer wood growth, then 1 cwt. of sulphate of ammonia can be drilled in in the spring in addition. It is best to apply the manures a couple of periods in the year. Use one-half of the superphosphate and bonedust with the potash for the autumn application, and do not apply the remainder of the manure until the new growth is well out (about November).

If a heavy dressing of bonedust and superphosphate is placed in the ground during the winter months, it often causes a very heavy wood growth, which is often of a sappy nature, that grows rampant at the beginning of the season, and causes canes to grow with long internodes, which do not make good fruiting canes. It is better to have two or three moderate meals in a day than one huge feed, and by the method of giving the vine the manure in two or even three dressings, the vitality and strength of the plant is evenly maintained throughout the whole year.

According to the crops the vines produce, so must the manuring be increased, and one well-known Mildura grower gives his vines up to half a ton per acre every year of the mixed manures quoted, and his results of late years have been phenomenal.

Coming Agricultural Bureau Conferences.

Six districts (as distinct from sub-district) conferences are now being held annually by the Agricultural Bureau, in addition to the State conference. The value of these gatherings to the movement is considerable. An effort is made to hold them in different centres each year, and the hope is expressed by the Advisory Council that every member will attend at least one conference yearly and assist in making education by travel a feature of Bureau work.

Last month saw conferences at Wollongong and Gosford, while among those impending are the northern district conference at Glen Innes (3rd to 5th February), North Coast at Dungog (17th and 18th February), and southern district at Tumut and Batlow (24th to 27th March). Following these will come the Parkes conference at a date in April yet to be fixed.

The cow that dislikes her milker, and is afraid of him never does her best, says "Dairying in Kansas" (Kansas State Board of Agriculture). Milk is formed largely during the process of milking, and nervous excitement at this time retards its secretion. The more quiet and contented the cow can be kept the more milk she will give. "Kindness and gentleness in handling dairy cows is a practical dollar-and-cents matter."

Pure Seed.

Growers Recommended by the Department.

The Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops, in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon, and (2) after a sample of the seed has been received by the Under Secretary and Director, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the prices for the seeds mentioned hereunder.

Wheat :—	
Firbank	Manager, Wagga Experiment Farm, Bomen.
Hard Federation	Manager, Wagga Experiment Farm, Bomen.
	Manager, Experiment Farm, Cowra.
	Manager, Experiment Farm, Temora.
Canberra...	Manager, Wagga Experiment Farm, Bomen.
	Manager, Experiment Farm, Cowra.
	Manager, Experiment Farm, Temora.
	E. J. Allen, Gregra.
	W. W. Watson, "Woodbine," Tichbourne.
Zealand	Manager, Wagga Experiment Farm, Bomen.
Wandilla	Manager, Wagga Experiment Farm, Bomen.
	Manager, Experiment Farm, Cowra.
	Manager, Experiment Farm, Temora.
	W. W. Watson, "Woodbine," Tichbourne.
Yandilla King	Manager, Wagga Experiment Farm, Bomen.
	Manager, Experiment Farm, Temora.
	Manager, Experiment Farm, Cowra.
	W. W. Watson, "Woodbine," Tichbourne.
Currawa	E. J. Allen, Gregra.
Marshall's No. 3	Manager, Wagga Experiment Farm, Bomen.
	E. J. Allen, Gregra.
Riverina...	Manager, Wagga Experiment Farm, Bomen.
Federation	Manager, Wagga Experiment Farm, Bomen.
	Manager, Experiment Farm, Temora.
Waratah...	Manager, Wagga Experiment Farm, Bomen.
	Manager, Experiment Farm, Cowra.
	Manager, Experiment Farm, Temora.
Improved Steinwedel	E. J. Allen, Gregra.
Cleveland	Manager, Experiment Farm, Bathurst.
Gresley	Manager, Experiment Farm, Cowra.
	Manager, Experiment Farm, Temora.
	Manager, Experiment Farm, Condobolin.
	W. W. Watson, "Woodbine," Tichbourne.
Clarendon	Manager, Experiment Farm, Glen Innes.
Florence	Manager, Experiment Farm, Glen Innes.
Oats :—	
Algerian	Manager, Experiment Farm, Bathurst.
	Manager, Experiment Farm, Glen Innes.
	Manager, Experiment Farm, Temora.
	F. Rose, junr. "Rosemount," Cunningar.
	E. J. Allen, Gregra.
Guyra	Manager, Experiment Farm, Glen Innes.
Lachlan...	E. J. Allen, Gregra.
Mulga	E. J. Allen, Gregra.

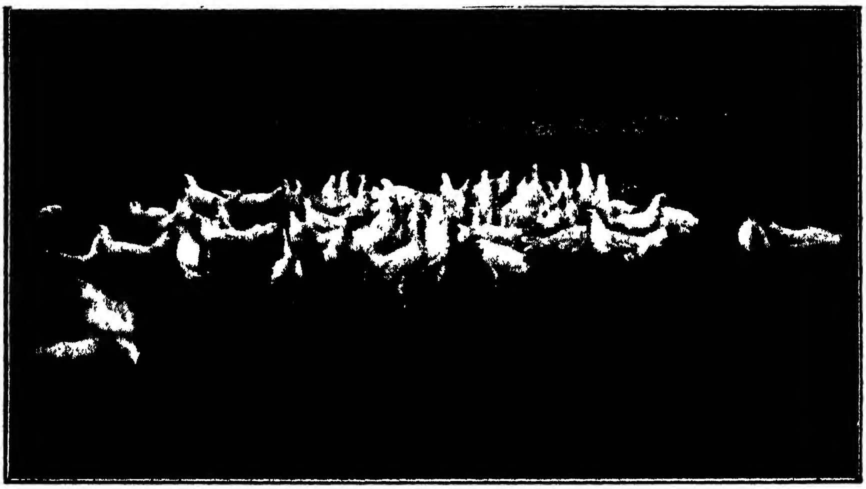
A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

Poultry Notes.

FEBRUARY.

JAMES HADLINGTON, Poultry Expert.

WHAT to do with the thousands of cockerel chickens which poultry-farmers cannot, or will not, keep to the age necessary to make them good table poultry is a problem that confronts both farmer and selling agent. The former blames the latter for not securing a payable return, while the selling agent blames the poultry-farmer for flooding the market with a product that he well knows is in over supply during certain months of the year. The position is most unsatisfactory to all concerned, because while the poultry-farmer has reared these cockerel chickens at a loss no one benefits, not even the consumer.



An average Pen of the Chickens exported.
The photograph was taken the day before the birds were killed and packed.

The trouble is not a new one. It is as old as the day in which the poultry industry became specialised. Various suggestions have been put forward with the object of dealing with the problem, but so far without practical result. The only remedy has been for the poultry-farmer to keep these chickens till they are old enough to make more weight. Unfortunately many farmers, through lack of accommodation or inability to stand the strain of feeding, are unable to make the most of their cockerel output. So intensified has this become that hundreds of farmers would kill off their male chickens as soon as hatched if only they could distinguish them from the pullets. As they cannot do this, many thousands of these cockerel chickens of September hatching are sold when 2 or 3 months old at prices

which return less than the chickens were worth at one day old. When it is visualised that the same class of chickens two months earlier in the spring brings 6s. to 9s. per pair, it will be realised that from an economic point of view great waste is going on.

Farmers are quite well aware of all this, but in the main they are helpless in the matter, because of the lack of the wherewithal to handle their product to advantage. Nor is this all. These potentially good table chickens, owing to the fact that they usually make such low prices, are for the most part ill-cared for, and are only treated as a by-product to be got out of the way.

Dressed and ready to be Packed for Export.

Looking t · the future of the ı ultry industry, with the possibilities that present themselves by reason of the natural increase in the local consumption of eggs (owing to extended industrial activities), and by reason of the development of the export trade, great strides should be made by the industry during the next decade. With regard to the table poultry position, nothing very serious has happened while we have been producing eggs for local requirements, but any considerable expansion in egg-production brought about by an export trade in eggs will mean a big surplus of cockerels, and unless these too can be exported, the last state of the poultry-farmer will be worse than the first. It is clear, then, that, if possible, an outlet must be found for the surplus that is almost certain to be in evidence at no distant date.

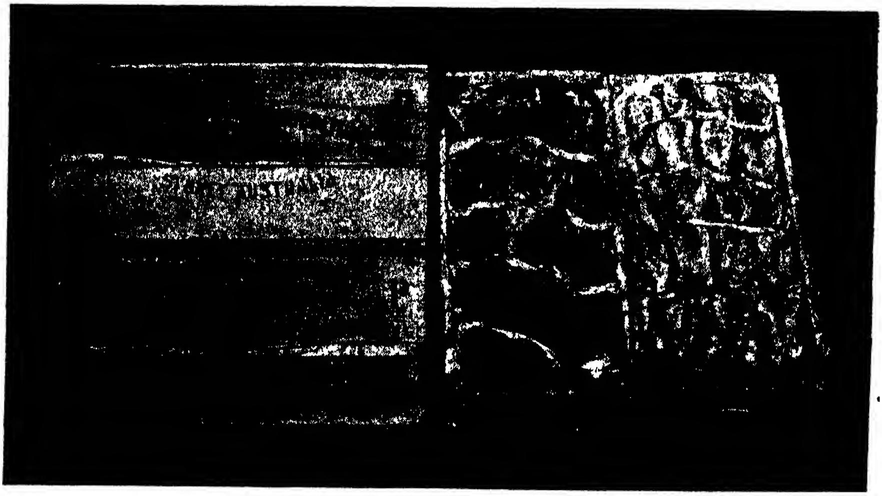
If proof of this contention is needed, it will be found in the fact that the increased hatching in 1924 over those of the two previous years has resulted

in an all-round reduction of 20 to 25 per cent. in the prices received for even prime cockerels. It is useless to blame other factors for the fall in prices, because it is undoubtedly the extra quantity of birds offering that is at the root of the trouble, and while the prices made for prime large cockerels and early griller chickens might be regarded as payable, the problem of how profitably to dispose of the chickens referred to is unsolved.

Being fully seized with all the factors in the case, the Department decided to tackle the problem of the small chickens by making a trial shipment to London, and a consignment of thirty-one cases of chilled poultry was forwarded by the *Moldavia* on 14th January.

Particulars of the Consignment.

The chickens exported were drawn from Hawkesbury Agricultural College and from the Government Poultry Farm, Seven Hills. The consignment



Packed for Export.

consisted of sixty-four Black Orpingtons and 536 White Leghorns, making a total of 600 birds. The live weight ranged from 2 lb. to 2½ lb. When plucked and ready for freezing the total weight of the chickens packed was net 1,251 lb., or an average of 2 lb. 1 oz. each.

In this connection it might be pointed out that owing to the fact that the birds for export are not "drawn," but only loose their feathers, the weights are not the usual "dressed weights." If drawn in the same way as for local consumption, the weights would have approximated 1½ lb. dressed.

Preparation for Export.

These chickens were not fattened, but were for all practical calculations in ordinary store condition. The chickens were run and fed as usual up

to the last two weeks, when the ordinary grain feed given at evenings was dropped out and the chickens were fed entirely on their usual soft mash mixed with skim milk.

The idea of sending chickens with no more preparation was in order that the experimental shipment should be made under conditions possible to every poultry-farmer. There is, therefore, no question of this being a fancy or specially prepared consignment, and whatever the result—good or bad—it should be a safe guide so far as it goes.

It might be explained that under ordinary practice at the College, and also at the Government Poultry Farm, these cockerels would not have been marketed at the age they were when packed for London.

In making this consignment of chickens it is realised that so small a lot will make little or no difference to the local market, but if it shows the way to a profitable trade in export of chickens it will have achieved something that neither the farmer nor his agents were able or willing to do for themselves. If failure should unhappily occur, it will be but a small loss to the State compared with the educational value of the trial shipment.

Cost of Preparation and Despatch.

The cost of dressing, cases, freezing, delivery, and freight to London was within a fraction of 1s. per bird, a rate that does not appear at all prohibitive. It is as low as is likely under present conditions, and at the same time it is quite as high as it might be anticipated on future shipments, should any be made.

The size of the cases in which the chickens were packed was over all 27 inches x 13 inches x 7 inches. The number of chickens to the case varied from fifteen to twenty-four. The following were the actual numbers that made up the consignment:—

11	cases	contained	20	chickens to the case.	1	case	contained	23	chickens to the case.
7	,,	,,	16	,, ,,	1	,,		22	,, ,,
5	,,	,,	19	,, ,,	1	,,		17	,, ,,
4	,,	,,	24	,, ,,	1	,,		15	,, ,,

A Handbook on Agriculture.

A book on agriculture of which over 10,000 copies have been sold should have an undisputed claim to the attention of the farmer. The wide popularity of "The Farmers' Handbook," compiled by officers of the Department of Agriculture. New South Wales, may, no doubt, be attributed very largely to the practical flavour that has always pervaded its pages. The effort has always been to maintain the equilibrium between the suggestions of modern science and the limitations of field practice. A solid and copiously illustrated publication of just on a thousand pages, it constitutes a safe guide to profitable farming. It is obtainable from the Government Printer, or from the Department of Agriculture, Bridge-street, Sydney, for 11s. 2d., post free, within Australia.

Orchard Notes.

FEBRUARY.

W. J. ALLEN and H. BROADFOOT.

CULTIVATION must still be continued, the weeds kept down, and the land maintained in a good state of tilth. It must always be remembered that trees not only have to mature a crop of fruit, but at the same time to develop blossom buds for the next season, and very often when the cultivation is neglected at this time of the year, particularly with late varieties of apples and pears, which are carrying heavy crops, it is impossible for the trees to make fully developed blossom buds, and consequently the following year the crop is very disappointing.

Codlin Moth.

Growers should still continue to fight this pest. Any cases which have been returned to the grower should be immersed in boiling water for three minutes, and all infested fruit should be boiled or burnt. The main thing is to destroy the grub before it leaves the infested fruit.

Fumigation of Citrus Trees.

Fumigation can be carried out this month, but under no circumstances should it be done if the trees are out of condition through lack of moisture in the soil, as a tree suffering from lack of moisture or adequate cultivation can easily be damaged by either spraying or fumigation. Fumigation is the only completely satisfactory way of controlling scale pests of citrus trees, and should be carried out at night.

If spraying is practised, the work should be done on cool days. Hot days should be avoided.

A leaflet on fumigation may be obtained free on application to the Under-Secretary and Director of Agriculture, Sydney, and growers are advised to study this leaflet carefully and strictly adhere to its contents. Each tree should be measured and the proper dosage corresponding with the size of the tree used. Guesswork and carelessness must be avoided.

Budding.

If trees are in good condition, it is not too late to re-work any unsatisfactory varieties. When selecting budding wood extreme care must be taken that buds are selected from proved trees. This applies to any variety of any kind of tree. Of course, some vary more than others, but it must be borne in mind that each tree has a transmissible quality capable of being perpetuated by bud selection.

Manuring and Cover Cropping.

If the orchard is in good condition this is a good time to apply artificial manures to citrus trees. It should be spread around the tree in a ring, the inner circumference of which should be just outside the outer circumference of the foliage of the tree.

Toward the end of this month arrangement should be made for the sowing of leguminous crops, such as are required for green manuring. In the drier districts it is unwise to attempt this practice except during a run of wet seasons. It is of paramount importance to sow the seed with manure.

Harvesting.

The later varieties of canning and drying peaches, and also late varieties of plums will be coming in during this month. Prunes, sultanas, and Gordo Blanco grapes will also be fit for drying. Fruit for drying is not fit for treatment until it is thoroughly ripe. Prunes intended for drying should not be gathered until they drop, and raisin grapes should not be harvested until quite sweet. This is the busiest month of the year for apple and pear growers in tableland and inland districts.

Caution must be exercised not to generalise too much as regards the right time to pick the fruit, as generalisations are sometimes misleading, but it may be safely stated that William's pears may be safely picked even when quite green, so long as they have reached a suitable size, for they will ripen up well. On the other hand, Packham's Triumph and Josephine De Malines must be allowed to hang until well matured.

So long as they have reached a marketable size, apples can be marketed as cookers before maturity is reached, so long as prices are remunerative. Generally speaking, later varieties should not be marketed when immature. Growers would be well advised to keep a keen eye upon the pickers to see that fruit is handled with care. Carelessness in picking cannot be too strongly deprecated, and pickers who cannot be trusted to do their work satisfactorily should be got rid of. Careless picking and handling are frequently the starting point of damage, which lessens, though it may not altogether destroy, the market value of fruit. The production of apples is a slow and costly process. No grower can afford to have his reward of years of waiting, and of labour and expense, jeopardised or nullified by irresponsibles who think more of immediate results to themselves than of their employer's interests.

Common Storage of Apples.

Generally speaking, there is every indication of a good crop of apples. Growers will be well advised to spread the marketing season over as long a period as possible, as they will then be able to work with less strain to obtain more remunerative results, and to market their fruit with that greater care which is associated with time for deliberation and judicious expenditure of energy. Picking, packing, and marketing can be done more carefully, and gluts are minimised. The common storage of apples is a valuable supplement

to cold storage, particularly in the case of some of our good keeping varieties in climates like those of Batlow and Orange.

The principle factors in the keeping qualities of apples are, (1) the inherent keeping quality of the variety, (2) the care exercised in picking, (3) picking at the proper stage of maturity, (4) promptness in cooling, and (5) proper storage accommodation.

Varieties differ greatly in their keeping qualities, and should only be held in storage for such periods as general experience justifies. Due attention should be given to the fact that apples can be successfully kept for much longer periods in cold than in common storage, and also that apples do not reach the consumer as soon as they are released from storage. The care in handling is of paramount importance. Preservation of the skin in a sound condition is absolutely essential to the avoidance of common rot organisms. Sound merchantable condition of any fruit depends more completely upon prevention of skin injury than any other factor.

The maturity of the fruit is very important, and as no definite rule can be laid down the grower must learn by careful observation and experience that the colour of the seed and the blush or colour of the variety are in some measure guides to proper maturity, but they are not absolutely dependable. The safest guide is the ground colour of the fruit. The ground colour, which is green before the apple begins to mature, gradually lightens and turns yellowish as maturity is reached, and until this change has taken place the apples are not mature enough for storage. Apples should not be allowed to become over-ripe, as this is as serious, if not more so, than immaturity.

In most varieties, especially when the yield is large, apples do not all mature at the same time, so it is necessary to get anything like uniformity of maturity to go over the trees several times. This has the advantage also of allowing the remaining immature apples to increase in size.

The size of apples is also an important factor. Generally speaking, apples ranging from 2¼ to 2¾ will keep for longer periods than large apples, but this difference is not so much due to the size in itself as to the forcing that induces the size, and the immaturity and poor colour that usually accompany it. Apples may develop a good size and keep well.

Prompt cooling and maintenance of even temperatures and humidity in common storage houses are important factors. Fruit held in high temperatures for any length of time after picking soon becomes over-ripe, and may lose a considerable portion of its storage life. Fruit picked in the heat of the day and allowed to remain in the sun will not keep so long or so well as that promptly placed in the shade, and cooled by remaining over night in boxes. The storage house should be well ventilated, and walls should be insulated. In stacking the fruit care should be taken to see that the cases are stacked in such a way that there will be a free circulation of air. Fruit will not keep in a stagnant atmosphere. In many cases storage accommodation is so badly designed and so badly utilised, that it accelerates rather than retards the decay of fruit.

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alterations of dates should be notified at once.

1925.

Society.	Secretary.	Date.
Nowra P. and A. Association ...	....	Feb. 12, 13, 14
Central Cumberland A. & H. Association (Castle Hill)	H. A. Best ...	,, 13, 14
Tahmoor and Couridjah A. H. and I. Society...	E. S. Key ...	,, 13, 14
Queanbeyan P. and A. Association ...	....	,, 17, 18
Guyra P. and A. Association ...	P. N. Stevenson...	,, 17, 18, 19
Pambula A. H. and P. Society ...	L. K. Longhurst...	,, 18, 19
Milton A. and H. Association ...	F. W. Cork ...	,, 18, 19
Alstonville Agricultural Society ...	W. J. Dunnet ...	,, 18, 19
Tilba A.P. and H. Society ...	R. L. Hapgood ...	,, 18, 19
Hannamvale A. Society ...	W. H. Buttsworth	,, 20, 21
Kangaroo Valley P. and A. Association ...	....	,, 20, 21
Luddenham P. and A. Society ...	....	,, 20, 21
Nimmitabel A. and P. Association ...	R. K. Draper ...	,, 24, 25
Uralla P. and A. Association ...	D. T. McLennan...	,, 24, 25, 26
Gunning P. and A. Association...	....	,, 25, 26
Mullumbimby P. and A. Association ...	....	,, 25, 26
Warialda P. and A. Association ...	....	,, 25, 26
Adaminaby A. Society ...	P. L. Crisp ...	,, 26, 27
Newcastle A. H. and I. Association ...	E. J. Dann ...	,, 24 to 28
Blacktown A. Society ...	J. McMurtrie ...	,, 27, 28
Robertson A. & H. Association ...	A. E. Myers ...	,, 27, 28
Bega A. P. and H. Society ...	H. J. B. Grime ...	Mar. 3, 4
Coonabarabran P. and A. Association...	C. D. Cox	,, 3, 4
Braidwood P. and A. Association (Jubilee Show) ...	R. L. Irwin ...	,, 3, 4, 5
Inverell P. and A. Association ...	....	,, 3, 4, 5
Yass P. and A. Association ...	E. A. Hickey ...	,, 4, 5
Tumut A. and P. Association ...	T. E. Wilkinson...	,, 4, 5
Bangalow P. and A. Society ...	....	,, 4, 5
Manning River A. and H. Association (Taree) ...	R. Plummer ...	,, 4, 5, 6
Oberon A. H. and P. Association ...	S. Marsden ...	,, 5, 6
Berrima A. H. and I. Society (Moss Vale) ...	W. Holt	,, 5, 6, 7
Walcha P. and A. Association ...	A. D. Murchie ...	,, 10, 11
Tumbarumba and Upper Murray P. and A. Society .	R. W. Stewart ...	,, 10, 11
Mudgee A. P. H. and I. Association ...	R. Shaw.... ...	,, 10, 11, 12
Cobargo A. P. and H. Society ...	T. Kennelly ...	,, 11, 12
Narrabri P. A. and H. Association ...	V. W. Jones ...	,, 11, 12
Coraki P. and A. Society ...	....	,, 11, 12
Bombala P. and A. Association ...	....	,, 11, 12
Wauchope P. and A. Association ...	....	,, 12, 13
Hunter River A. and H. Society (West Maitland) ...	J. S. Hoskins ...	,, 11, 12, 13, 14
Bellinger River A. Association (Bellingen) ...	J. F. Reynolds ...	,, 12, 13, 14
Campbelltown A. Society ...	W. N. Rudd ...	,, 13, 14
Batlow A. Society... ...	C. J. Gregory ...	,, 17, 18
Cumnock P. A. and H. Association ...	K. J. Abernethy...	,, 18
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Crookwell A. P. and H. Society ...	C. H. Levy ...	,, 19, 20
Nepean A. H. and I. Society (Penrith) ...	C. H. Fulton ...	,, 20, 21
Rydal A. H. and P. Society ...	S. Bruce Prior ...	,, 20, 21
Blayney A. and P. Association ...	H. R. Woolley ...	,, 24, 25
Dorrigo and Guy Fawkes A. Association (Dorrigo) ...	A. C. Newman ...	,, 24, 25

[Subsequent dates noted and held over.]

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Agricultural Gazette of New South Wales.

Farmers' Experiment Plots.

WHEAT, OAT, AND BARLEY EXPERIMENTS, 1924.

Southern District.

E. S. CLAYTON, H.D.A., Agricultural Instructor.

DURING 1924 the Department conducted field experiments in co-operation with the following farmers:—

J. Busch, "Naradhun," Hillston.
Carew Bros., "Selbourne," Deniliquin.
G. C. P. Circuitt, "Uabba," Lake Cargelligo.
P. Corcoran, "Waroona," Moombooldool.
D. and J. Gagie, "Spy Hill," West Wyalong.
W. Glenn, "Maneroo," Mathoura.
Gollasch Bros., "Pine Park," Milbrulong.
G. Gow, "Hughendon," Barellan.
W. V. Herbert, Bongalong.
Hobson Bros., "Glenlea," Cunningar.
A. Jennings, "Raywood," Coolamon.
Johns Bros., "Woolongough," Ungarie.
H. T. Manning, "Ravenstone," Barellan.
T. W. Pearce, "Aboukir," Hughstonia.
W. R. Smith, "Rosedale Park," Yuluma.
R. H. Thackeray, "Woornack," Young.
W. Thornton, "Spring Farm," Berrigan.
T. W. Turner, "Kia-Ora," Lake Cargelligo.

Cultural Details.

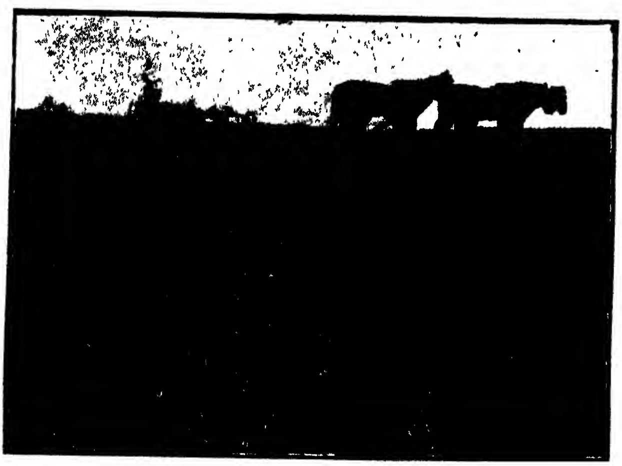
Barellan (H. T. Manning).—Soil, red loam, medium strength. August fallow, springtooth cultivator and harrows used after rain. Sheep on fallow. Early sowing, 15th April. Seed, 58 lb., superphosphate 56 lb. per acre. Midseason sowing of Waratah, Canberra, and Early Bird on 7th May, ; seed, 64 lb., and superphosphate 75 lb. per acre. At this centre Federation and Union were attacked by flag smut, while Canberra showed no signs of infection. During November, 7 inches of rain was recorded, and crops were badly lodged.

Barellan (G. Gow).—Heavy brown loam (boree country). September fallow; springtoothed October, and again prior to sowing. Sown 14th April; seed 55 lb., superphosphate 56 lb. per acre.

Berrigan.—Very strong brown loam. Ploughed July, harrowed August, disced September, harrowed February, springtoothed March, harrowed and disced again just prior to sowing. Sheep on fallow throughout fallowing period. In spite of the discing (which was necessary on account of the heavy weed growth, induced by the rather moist summer), the fallow was in really first-class condition at planting time. Six cultivations were given, exclusive of ploughing, and although the soil is of a heavy nature, the excellent yields

obtained at this centre (40 bushels being obtained with Union) indicate that these heavy soils will tolerate and even be greatly benefited by a large number of cultivations when necessary (as in a moist summer), provided the land is worked only after rain. The plots were sown on 28th April with 58 lb. of seed, and 56 lb. of superphosphate per acre.

Sowing the Coolamon Plots.
The correct degree of cloddiness.



Surface too Cloddy.

Coolamon.—Fairly heavy red loam, under cultivation for over thirty-five years. Ploughed early August, harrowed February, springtoothed March, sheep on the fallow. Land rather cloddy at time of sowing. Sown 9th May, seed 58 lb., and superphosphate 56 lb. per acre. The oat plots at this centre were damaged by the heavy rains, and the results were not comparable.

Cunningar.—Light sandy loam, light-brown in colour. Ploughed 5 inches deep in October, harrowed November, springtoothed in April, and again in May. Sheep were on the fallow continuously. Sown 28th May; seed 60 lb., and superphosphate 84 lb. per acre. The oat plots were damaged by heavy rains

Deniliquin.—Heavy clayey loam, brown in colour. Ploughed in October, springtoothed and rolled in March, springtoothed and harrowed prior to sowing. Sheep on fallow throughout. Sown 26th April; seed 60 lb., and superphosphate 56 lb. per acre.

Hillston.—Bright red loam, light in character, rather deep, and typical of a large area of land in this locality. Ploughed about 4 inches deep in August, springtoothed in October and again in January, disced in March;

Sowing the plots at "Uabba," Lake Cargelligo.
The surface is too fine.

sheep on the fallow throughout. This fallow at planting time was very satisfactory as regards consolidation; it was, however, a little fine on the surface, due to the discing in March to kill weeds. Sown, 6th April ; seed 60 lb., superphosphate 56 lb. per acre.

Lake Cargelligo. (G. C. P. Circuitt).—These plots were situated about 20 miles from Lake Cargelligo, down the Lachlan towards Hillston. Virgin dark red loam, light in character and fairly deep, typical of large areas of land in the district. Ploughed September, harrowed in January, and again in February, and again prior to sowing. Heavily stocked with sheep throughout. This fallow was not in good order at time of planting, the consolidation being chiefly at fault. During the first few years, this country is rather loose, but improves greatly with cropping. Sown 9th April; seed 50 lb., superphosphate 42 lb. per acre. Heavy rains in November delayed harvesting.

Lake Cargelligo (T. W. Turner).—Dark-red loam of medium strength, Ploughed 3½ inches deep in July. Springtoothed in October, January-March, and again just prior to sowing. Sown 10th April; seed 48 lb., superphosphate 56 lb. per acre. Canberra was very badly attacked by flag smut. These plots were more favoured as regards rainfall than those situated on Mr. Circuitt's property; 3 inches more rain was received at Lake Cargelligo, and the yields at this centre were very high, Federation yielding 34 bushels per acre on a rainfall of 935 points for the growing period.

Mathoura.—Heavy clay loam, light red in colour (plain country); runs together easily and sets hard after rain. Ploughed 3½ inches deep in August, harrowed in October, springtoothed in February, harrowed in April; sheep on the fallow throughout. Sown 24th April; wheat 58 lb., and high-grade superphosphate 45 lb. per acre; oats 40 lb. and high-grade superphosphate 45 lb. per acre. Eaten off with sheep first week in July, and harvested first week in December. The oats were harvested in November. All plots were to some extent damaged by the rain storms.

Milbrulong.—Medium red loam; ploughed June, harrowed August, September, and October; disced in February to destroy summer weeds; scarified in March and April. This fallow was in good condition at time of planting as regards the degree of cloddiness and moisture content. Sheep were on the fallow throughout. Sown 12th May; seed 60 lb., superphosphate 56 lb. per acre.

Moombooldool.—Loose red sandy soil (mallee country). Ploughed June, skim-ploughed in March, springtoothed prior to sowing. Sown 15th May; seed 60 lb., superphosphate 56 lb. per acre. Very little straw growth is made on this light mallee country in normal years, and great difficulty is experienced in getting a good stubble burn; flag smut is therefore a troublesome disease, and all varieties were affected at this centre, particularly Aussie, Federation, and Waratah.

Ungarie.—Medium red loam, ploughed July, springtoothed October and February. Sown 20th May; seed 62 lb., superphosphate 65 lb. per acre.

Young.—Light loam. Ploughed August, harrowed in November; scarified in February and April; scarified and harrowed in June. Sown 11th June; seed 62 lb., superphosphate 70 lb.

Yuluma.—Strong red loam. Ploughed in October, harrowed in November, disced in March, harrowed in May. Sown 10th May; seed 60 lb., superphosphate 56 lb. per acre. At this centre very little difference in the yield of the varieties under trial occurred, excepting Major. The poor yield of this variety in a season so favourable to late-maturing varieties shows its unsuitability to this particular district.

The Season.

A remarkably favourable growing season was experienced over most parts of the district almost up to harvesting. Unfortunately, at this period disastrous storms were experienced at practically all centres. All the oat

plots, with one exception, were badly lodged and tangled, and the yields of many of the wheat plots were reduced. Harvesting was delayed and rendered difficult and tedious. Many of the plots were sufficiently late to benefit by the late rains, but most of the crops in the drier and earlier portions of the district suffered to varying extents. At West Wyalong the plots, which up to that date were looking very promising, were completely washed down by the heavy downpours.

The heavy rains spoiled large quantities of hay; only the centre sheaves of the stooks were worth carting in in many instances, while on low-lying land a large amount of hay was completely spoiled by the rush of surface water.

RAINFALL Records.

	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total for growing period.	Rainfall on fallow.
	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.
Barrellan (G. Gow)	37	66	162	76	182	116	91	...	...	730	1,210
Barrellan (H. J. Manning).	100	77	150	64	189	101	67	...	...	748	1,325
Bongalong ...	...	175	164	207	383	254	152	434	...	1,769	Sown on stubble
Berrigan	...	97	142	53	307	115	116	327	...	1,157	1,270
Coolamon	...	140	229	135	278	149	158	...	...	1,089	1,508
Cunningar ...	...	241	139	200	445	188	217	508	...	1,938	2,027
Deniliquin ...	...	60	176	80	250	79	124	399	...	1,168	949
Hillston	...	45	83	39	116	53	15	...	...	351	450
Lake Cargelligo ... (G.C.P.Circuitt).	43	97	150	43	188	95	68	...	...	684	870
Lake Cargelligo ... (T. W. Turner).	37	96	243	82	299	123	55	...	...	935	1,350
Mathoura	128	57	140	67	198	118	126	...	...	834	715
Milbrulong ...	...	170	255	98	262	133	107	440	...	1,465	2,066
Moombooldool ...	...	62	157	82	185	140	185	456	...	1,267	1,919
Ungarie	...	70	148	124	213	128	60	569	...	1,312	603
Young	...	...	189	171	263	307	192	396	56	1,574	1,426
Yuluma	...	140	206	111	229	109	104	100	...	999	1,167

Notes on Varieties.

Federation still proves to be the most suitable variety for the drier parts of the district, and gave the highest yields at Lake Cargelligo (on both T.W. Turner's and G. C. P. Circuitt's plots), Hillston, and Barellan (G. Gow).

Waratah gave very consistent yields at all centres; it is proving a very useful variety, and is rapidly becoming very popular among farmers. It is stronger in the straw than Canberra, and in many localities it is likely to take the place of this variety.

Union yielded best at Mathoura and at Berrigan (where a yield of 40 bushels per acre was obtained). Wandilla topped the yields at Cunningar and Deniliquin, and also gave very consistent yields at all other centres.

Union and Wandilla are both becoming popular. Early Bird proved successful at Moombooldool on the light sandy mallee country, but gave disappointing results at this centre the previous year. At all other centres this variety has given poor yields. As a hay variety, however, for the very dry localities,

The Federation plot at Moombooldool.
These plots were on light mallee soil.

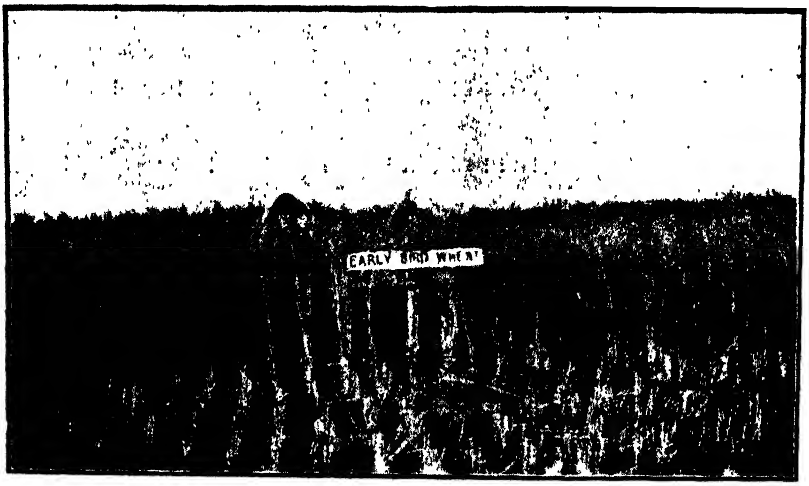
The Riverina plot at Moombooldool.

it certainly shows some merit. Riverina, like Canberra, is proving to be rather weak in the straw, and lodges readily in bad weather. Aussie has not as yet shown any great suitability to any locality in the southern district. Huff's Imperial (a Victorian selection from Federation) was tried at Mathoura. It did not yield so well as Federation, Union, or Wandilla.

This is the second year that Union, Wandilla, Waratah, Aussie, Riverina, and Early Bird have been widely tested in the southern district. Union, Wandilla, and Waratah have given highly satisfactory results, and are becoming very popular among the farmers. Aussie, Riverina, and Early Bird, on the other hand, have not as yet shown any particular merit as grain varieties.

Diseases.

Flag smut proved to be the most troublesome disease, but fortunately was not quite so much in evidence as in the previous season. It appeared to be more prevalent in the lighter soils this year, and was particularly noticeable where the stubble of the previous crop was not properly burnt. A good stubble burn appears to be one of the most effective means of checking the disease, and farmers are strongly advised to burn their stubbles as soon as possible.



Early Bird at Moombooldool.

All the seed for this season's experiments was treated with copper carbonate. The germination and early growth was much better than that usually following treatment by the bluestone method, and, in addition, no trace of bunt was found in any of the plots. The dry copper carbonate treatment is rapidly superseding the use of bluestone throughout the district.

Although rust was noticeable on the flag to some extent, this disease did not cause any serious loss, as the occasional hot dry spells checked the development of the rust spores.

Wheat leaf blight was noticeable on a few of the crops, but only to a slight extent. This is a seasonal disease which destroys the leaves of the plant. It was encouraged by the cold, moist weather.

Manurial Trials.

A glance at the yields in the manurial trials shows the heavier dressings of superphosphate giving the best results at almost all centres. At Moom-

VARIETY Trials.

Variety.	Barellan. (G. Gow.)	Barellan. (H. T. Manning.)	Bongalong.	Berrigan.	Coolamon.	Cunningar.	Deniliquin.	Hillston.	Lake Cargelligo. (G. C. P. Circuitt)	Lake Cargelligo. (T. W. Turner).	Mathoura.	Milbrulong.	Moombooldool.	Ungarie.	Young.	Yuluma.
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Aussie ...	27 37			24 45	24 56	...	...	...	...	...	...	21 20	15 53	16 33	30 26	18 20
Canberra	27 13	20 13	17 48	30 0	26 0	36 28	9 32	17 0	20 23	27 40	Lodged	26 0	16 1	25 0	31 10	18 27
Clarendon	...	...		...	...	...	...	...	...	...	...	...	15 9	...	...	...
Cleveland	...	...	18 6	...		...	...		...	...	...	...	...	...	...	...
Currawa ...	25 5	26 57	...		22 56	30 43	...	15 20	21 55	...	...	...	17 15	...	...	...
Dollar	...	...	...	34 15	...	...	...		...		...	...	...	...	...	...
Early Bird	...	19 44	...	23 57	...	...	1 39	14 20	14 47	21 16	...	...	19 3	16 42	...	...
Federation	32 1	23 52	...	32 15	21 20	30 3	19 18	18 0	25 12	30 56	...	20 56	15 13	22 33	21 32	18 0
Florence				...			...	13 20					18 31		...	
Gresley . ..	31 33	20 48	32 0	28 31	24 50	32 24	9 16	16 10	18 29	27 24	19 12	24 40	18 39	20 42	29 16	20 20
Hard Federation ..	...	...	...	...	...	33 17	...	...	...	...	21 26	19 38	...	...	24 48	...
Huff's Imperial ..	...	...	...	...	...	...	...		...	...	24 18	...	...	...	...	...
Indian F x Telford ...	...	...	...	...	...	...	...	...	...	...	...	...	...	21 24	...	...
Indian F x Federation.	...	...	...	...	...	...	...	...	...	...	...	...	...	22 21	...	...
Major	26 40	23 41	23 12	35 35	...	33 10	...	13 34	18 32	29 0	22 58	21 16	...	11 55	23 48	13 6
Marshall's No. 3 ...	...	...	...	...	...	31 50	...	...	...	...	...	...	...	...	...	...
Riverina	25 0	22 8	22 16	23 0	21 6	...	...	...	...	27 10	Lodged	20 30	15 53	...	26 52	19 17
Union	...	24 43	...	40 19	...	...	...	15 50	...	...	26 52	...	...	...	22 10	...
Wandilla	30 56	23 52	...	34 25	26 8	38 10	20 18	...	21 28	29 10	26 8	25 24	17 13	21 54	30 24	18 51
Waratah	29 53	19 29	28 0	33 55	25 20	35 46	10 50	16 30	19 56	29 20	19 40	24 40	16 27	22 57	32 10	18 49
Yandilla King ..	...	...	25 12	...	27 20	33 58	...	...	...	...	...	...	...	...	25 56	...

MANURIAL Trials.

Fertiliser. lb. per acre.	Barellan. (G. Gow.)	Barellan. (H. T. Manning.)	Bongalong.	Berrigan.	Coolamon.	Cunningar.	Deniliquin.	Hillston.	Lake Cargelligo. (G. C. P. Circuitt)	Lake Cargelligo. (T. W. Turner).	Mathoura.	Milbrulong.	Moombooldool.	Ungarie.	Young.	Yuluma.
No manure	...	.	...	...	.	17 56	...	...	...	...	...	...	...	...	17 16	10 14
Superphosphate— 28 to 30 ...	31 16	...	...	...		...	...	16 30	...	...	...	...	...	...	21 42	...
40 to 45 ...	...	...	...	.	...	...	...	17 20	25 12	...	24 34	...	...	...	...	...
High-grade Superphosphate (22%)— 45	...	23 40	...			...		...	24 20	...	...	...	...	...	...	...
Superphosphate— 56	32 1	23 52	...	32 15	21 20	27 56	19 18	18 0	25 56	30 56	...	20 56	15 13	...	...	18 0
65 to 70 ...	...	...	...	...	22 0	...	...	...	...	...	26 14	...	...	22 33	31 10	...
High-grade Superphosphate (22%)— 67	...	26 17	...	...	...	...	...	...	24 20	...	...	...	...	...	...	...
Superphosphate— 80 to 84 ..	35 13	24 29	.	35 21	21 40	27 36	18 54	...	25 44	32 52	...	22 26	...	22 0	...	...
90 to 95 ..	...	...	...		.	...	.	...	...	...	27 6	...	19 27	...	...	...
112 ...	...	...	...	35 44	...	...	20 0	...	...	34 48	...	23 46	...	...	26 32	18 16
132	...	...	...	...	...	.	...	...	...	...	...	...	22 47	...	...	...

booldool, on light, sandy soil (mallee), 132 lb. of superphosphate gave the highest yield, showing an increase of 3 bushels over the plot that received 90 lb. of superphosphate, and 7 bushels over that which received 56 lb. per acre.

High-grade superphosphate (22 per cent.) was this year tested alongside the ordinary superphosphate (16 to 18 per cent)., 45 lb. and 67 lb. of high-grade superphosphate being tested against 56 lb. and 84 lb. respectively of ordinary superphosphate, these quantities having the same phosphoric acid content. Should the high-grade superphosphate prove satisfactory a saving in freight, handling, &c., will be effected. No definite conclusions can be drawn from this year's trials, and the experiment will be repeated during the coming season.

Seeding Test.

At Mathoura a seeding test was carried out with Federation. The soil was a heavy clay loam; the plots were sown on 24th April with high-grade superphosphate at 45 lb. per acre. A seeding of 58 lb. per acre was compared with 80 lb. of seed per acre.

The plot receiving 58 lb. of seed yielded 24 bus. 34 lb. per acre, and that sown with 80 lb. of seed yielded 27 bus. 52 lb. per acre. This shows an increase of 3 bus. 18 lb. in favour of the heavier seeding. These results are in agreement with the seeding experiment conducted the previous year.

As there is a tendency towards heavier seeding, further experiments will be carried out in other parts of the district during the coming season. It was noted during the judging of crop competitions that heavy seeding (70 to 80 lb. per acre) was giving excellent results in most localities. There is no doubt that heavy seeding and manuring on early and well-worked fallow will give the best results in the safer parts of the district. It should be borne in mind, however, that it will not make up for any neglect in the working of the fallow. On the contrary it would not be advisable in a normal season to put a heavy seeding and manuring on late-ploughed or neglected fallow, and certainly not on stubble land. Heavy seeding and manuring will produce the maximum yield when the fallows are in good condition and well supplied with moisture.

Oat Variety Trials.

Oat variety trials were planted at four centres, but unfortunately the severe rain-storms so damaged the crops that comparable results could only be obtained at one centre, viz., Mathoura. Even at this centre the yields were reduced by the heavy rains, and difficulty was experienced in harvesting. The yields were as follows :—

	bus.	lb.
Quondong	41	34
Mulga	38	32
Algerian	36	8

North-western District.

C. McCAULEY, Agricultural Instructor.

The following farmers co-operated with the Department in carrying out the 1924 trials of cereals:—

W. A. Manning, "The Pines," Curlewis.
Mrs. M. A. McDonald, "Toryburn," Gunnedah.
R. A. Studd, Boggabri.
J. H. McDonald, Ashley, *via* Moree.
J. A. Wilkinson, Warialda.
Cosh Bros., Pallamallawa.
A. M. Paterson, "Green Hills," Delungra.
V. Rolfe, Dog Trap, Inverell.
G. Smith, "Kildare," Wee Waa.
M. Daley, Nullamanna, Inverell.

Cultural Details.

Wee Waa.—Red loam, ploughed in spring of 1923, and sown with maize. The maize was kept cultivated between the rows until the crop became overrun with summer grass. The land was then ploughed 5 inches deep during the first week of May. The seed-bed was very full of summer grass, which was raked up and burnt. The seed was sown on 17th May, at the rate of 45 lb. per acre.

Nullamanna.—Red basaltic loam, ploughed 8 inches deep in January, 1923. Disc-cultivated in May, 1923. Reploughed 4 inches deep in August, and again in April, 1924; harrowed just prior to sowing. The seed was sown on 12th and 13th May, at the rate of 50 lb. per acre.

Gunnedah.—Red loam, ploughed on 5th December, 1923; harrowed 3rd February; springtooth-cultivated 18th March and 20th April. The seed was sown on 21st May, at the rate of 60 lb. per acre.

Ashley.—Chocolate loam; these plots were sown on land new to cultivation or on old cultivation land. The new land was ploughed the end of January, and harrowed once in February and once in March; springtooth-cultivated in April and May. The old land was ploughed the first week in February; harrowed in February and March, and springtooth-cultivated in May. The seed was sown on 19th May, at 52 lb. per acre.

Boggabri.—Red loam, ploughed 9 inches deep in August and left until January, and worked four times with springtooth and disc cultivators. The seed was sown on 2nd June, at 45 lb. per acre.

Inverell.—Heavy black clay loam, ploughed January, 1924, and kept well worked until sowing time. The seed was sown on 1st March at 50 lb. per acre.

Delungra.—Black basaltic, self-mulching loam, ploughed May and August, 1923; sown with maize in September. The maize failed, and the land was springtooth-cultivated on 10th January, 25th February, 14th April, 1st June, and 10th July, 1924. Three sowing periods were made on these plots, viz., on 15th May at the rate of 46 lb. per acre, on 2nd June at 50 lb. per acre and on 15th July at 50 lb. per acre.

The Season.

The yields of wheat obtained throughout this district last season are probably the heaviest ever yet recorded. Notwithstanding heavy lodging, shelling, and rust, it was not uncommon for yields up to 12 bags per acre to be recorded. The rainfall during the fallowing and sowing periods was satisfactory, and a good germination resulted in all cases.

The distribution of the rainfall was as follows :—

	April.	May.	June	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.
Delungra ...	·72	·40	1·82	2·63	3·71	1·94	2·38	3·91	1·23	17.74
Wee Waa ...	...	·36	2·97	1·64	·34	1·64	·94	1·24	...	9·13
Inverell... ...	...	...	2.98	2·81	2·94	1·76	3·17	3·89	·70	18·25
Boggabri ...	...	...	1·22	2·33	1·67	2·14	·95	4·89	...	13·30
Gunnedah ...	...	...	1.71	1·36	2·91	4·53	1·33	1·30	...	13·14
Ashley* ...	...	...	...	...	...	...	...	...	...	...

* No records available.

The accompanying table shows that the winter rains were sufficient and the harvest rainfall exceptionally high, while October was sufficiently dry to ward off the threatened attacks of rust Rust-liable varieties, such as Federation, Hard Federation, and Steinwedel, when sown late or on heavy ground suffered severely from the heavy November rains, and in some cases over 50 per cent. of the promised yields were lost. Canberra, Florence, and Currawa lodged badly as the result of these rains.

WHEAT Variety Trials.

Variety.	Gunnedah.	Nullamanna.	Wee Waa.	Ashley.	Delungra.	Boggabri.
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Cleveland ...	...	54 7	...	...	28 37	...
Wandilla ...	...	45 37	26 50	...	...	...
Early Bird ...	24 10	...	27 50	†20 10	17 51	31 40
Clarendon ...	*17 5	41 20	24 10	...	32 17	35 0
Waratah	28 52	48 45	22 1	40 6	21 25	34 22
Federation ...	27 28	...	21 20	...	...	...
Riverina	27 30	39 10	31 27	†20 40	15 30	...
Canberra ...	34 10	37 0	22 30	†21 0	10 48	...
Aussie	38 0	49 56	25 10	...	22 56	40 20
Marshall's No. 3...	25 5	...	...	34 17	...	...
Florence	...	33 0	...	...	...	...
Queen Fan ...	...	...	21 15	...	37 16	27 23
Hard Federation	...	...	...	27 17	Nil.	...
Currawa—						
Early Sowing...	...	...	...	...	33 20	...
Mid-season sowing	...	...	...	...	22 38	...
Late sowing ...	...	...	...	...	18 50	...
Queen Fan (Farmer's seed).	...	...	...	...	36 27	...
Major	...	...	...	...	18 21	...

* Very poor germination.
† Very badly lodged and shelled. Yields not comparable.

The harvest rains caused a great amount of lodging and shelling in the plots, thus greatly reducing the yields, and to a large extent impairing the value of the results as to the yielding capacity of the different varieties. In some cases, owing to wet weather, the harvesting period was extended over two weeks, and the losses were by no means uniform. Hail absolutely ruined the plots at Pallamallawa, Curlewis, and Warialda.

Notes on the Varieties.

The performance of Aussie was particularly encouraging. It yielded remarkably well at all centres except Delungra, where it was knocked about by the heavy weather. It stands up well, is fairly rust resistant, and is not liable to shell.

Waratah and Clarendon both caused much favourable comment. They are both fairly rust resistant and stand up well. Clarendon does remarkably well on the heavy black soil.

Canberra again proved itself one of the most suitable early varieties, though it lodged badly at Ashley, and was badly rusted at Delungra.

Early Bird on this year's results appears to be a most promising variety for the drier districts. Cleveland again proved itself a most suitable variety for the Inverell district. Currawa promised to yield well at Delungra, but the yield was greatly reduced owing to the rotting of the ripened straw.

There is little need for further comment regarding the other varieties, except that Federation yielded fairly well at Gunnedah, and Hard Federation was a total failure through rust at Delungra.

Other Trials.

A rotation experiment was planted at Wee Waa, with the following result :—

Wheat after bare fallow	23 bushels.
Wheat after maize	16 „
Wheat after Sudan grass	14 „

Oat variety trials were sown at Wee Waa, Curlewis, Inverell, and Pallamallawa, but owing to heavy harvest weather at Inverell, and hail storms at Pallamallawa and Curlewis, the plots were so damaged that results are only available from Wee Waa. At that centre Mulga yielded 34 bus. 11 lb.; Fulghum, 42 bus. 21 lb.; and Algerian, 33 bus. 17 lb.

The land for this trial was ploughed in October, 1923; springtooth-cultivated three times and reploughed on 26th January, 1924; springtoo h-cultivated in March, and reploughed and harrowed in May.

Manurial trials were conducted at Pallamallawa, Wee Waa, Boggabri, Gunnedah, and Curlewis. The plots at Curlewis and Pallamallawa were completely destroyed by hail.

Variety.	Rate of Superphosphate per acre.	Gunnedah.	Boggabri.	Wee Waa.
	lb.	bus. lb.	bus. lb.	bus. lb.
Hard Federation ...	Nil.	21 4	....	18 20
Clarendon	Nil.	....	35 0	....
Waratah	Nil.	....	34 22	....
Hard Federation ...	37	24 54	....	....
" ...	38	....	....	26 40
Clarendon	60	....	31 27	....
Waratah	60	....	36 0	....
Hard Federation ...	76	....	....	21 30
" ...	87	27 25	....	....

At Gunnedah the results favour a heavy dressing, while at Wee Waa a light dressing appears to be sufficient. The results at Boggabri were most contradictory. Cultural details and rainfall are given above.

Northern District.

M. H. REYNOLDS, H.D.A., Senior Agricultural Instructor.

The following farmers conducted plots of wheat and barley for the Department during the past season :—

G. Dobson, 14 miles west of Tamworth.
W. Lye, Loomberah, 14 miles east of Tamworth.
J. G. Perry, 8 miles west of Quirindi.
E. Currell, 7 miles south-west of Barraba.
A. Douglas, 4 miles west of Manilla.
A. Haskins, 1 mile north of Duri.
J. T. Elliott, Dangarsleigh, 8 miles south-east of Armidale.
W. G. Geyer, Washpool, 4 miles north-west of Tenterfield.

Messrs. Dobson, Perry, Geyer, and Douglas obtained good yields. Mr. Geyer's harvest results were not to hand when this report went to press.

The Season.

Generally, early spring conditions were satisfactory, there being good germination and healthy growth. In November the rainfall was excessive for grain production, and caused rapid growth, with attendant weakness of the straw. Wind storms accompanying the rain helped to increase the lodg'ng of the crop. Stem and flag rusts made rapid progress, and caused pinched or ight grain. The seed for the plots was in every instance treated with dry copper carbonate at the rate of 2 ounces per bushel, with very sa'isfactory results. There was evidence of better germination and more vigorous plant growth in the early stages, where the seed was treated with this chemical, as compared with the wet treatment, bluestone.

An organism that caused root rot was fairly prevalent, also a blanching of the ears and stem with damaged grain, possibly due to rain, light, and heat on the same day.

Flag smut was very prevalent in portions of the district, where it has not been observed for twenty years. The average of 17 bushels for the whole district indicates the high yields obtained by some. From 30 to 40 bushels per acre were harvested in some instances over hundreds of acres, but on other sections yields down to 6 or 8 bushels.

The header (or reaper thresher) again demonstrated how down and tangled crops can be saved; without this machine possibly one-third less wheat would have been saved this season. In parts of the district the grain had shot slightly in the ear before being harvested, due to the wet conditions, and rust caused some grain to be unsaleable, weighing very light and pinched.

Good quality grain was obtained, however, throughout the district.

RESULTS of Variety Trial.

Experimenter.	Aussie.	Canberra.	Clarendon.	Early Bird.	Riverina.	Wandilla.	Waratah.	Hard Federation.	Queen Fan.	Marshall's No. 3.	Currawa.	Firbank.	Florence.	Sunset.
	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.
G. Dobson, Tamworth ...	33	31	30	29	26	25½	25½	22⅓	20	17	...	...	...	...
J. G. Perry, Quirindi ...	23¼	...	15	22½	19	...	20⅓	...	19⅓	...	20½	...	...	...
E. Currell, Barraba ...	9	25½	23	17⅓	14⅓	...	17⅓	...	19½	10	...	8½	...	...
A. Douglas, Manilla ...	30⅓	16½	17	20	24	...	18	...	...	...	12½	...	...	...
W. Lye, Loomberah ...	...	9	...	11½	15⅓	...	...	...	...	...	...	...	14	12

RAINFALL During Growing Period.

Place.		May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Tamworth and Loomberah.	Days	...	...	2	2	6	4	7	...
	Points	82	94	99	138	400	245	850*	...
Quirindi	Days	...	....	...	...	...	...	...	...
	Points	22	123	122	149	295	291	274	...
Barraba	Days	...	5	9	4	7	4	10	...
	Points	Nil.	258	344	283	331	168	519	...
Manilla	Days	...	11	9	4	9	4	...	...
	Points	...	409	135	209	289	125	...	...
Duri	Days	1	3	4	4	4	6	4	...
	Points	90	91	186	178	278	302	623	...
Armidale	Days	6	13	12	11	8	13	15	to 15th
	Points	43	242	379	247	231	291	483	177

* The November rainfall for Tamworth and Loomberah only applies to Loomberah. This record was supplied by Mr. G. Dobson, Winton-road, Tamworth.

Details of the Plots.

Tamworth.—Plots situated on gently sloping uplands; soil light red, free working loam, which sets somewhat quickly, with a tendency to run together

Variety trial section carried wheat in 1922 (unfertilised), harvested for grain; wheat in 1923 (unfertilised), sown for green fodder and fed off until September by sheep. This section was first cultivated fourteen years ago, and since then has been cropped with wheat on ten occasions. Superphosphate was sown with the wheat on this occasion. Ploughed 4 to 5 inches deep in September, 1923, the soil being moist; harrowed in October, to break up arge clods. Cultivated with a springtooth cultivator the latter part of January, early in February, and during April. These several stirrings, 3 to 4 inches deep, were essential, owing to the running together and setting of the soil after rain. Harrowed early in May; sown on 26th May in a moist seed-bed, at the rate of 41 to 49 lb. of seed per acre, the variation being due to freer running of some varieties; depth of seeding 1½ to 2 inches. Superphosphate at the rate of 42 lb. per acre was sown with the seed. A good germination and plant stand, evenly distributed, resulted.

The fertiliser section for these plots was fallowed in 1922, and carried wheat in 1923, 42 lb. of superphosphate per acre being applied with the seed. A yield of 21 bushels per acre was obtained. For the experiment plots the land was ploughed 4 to 5 inches deep late in December, 1923, after good rain; harrowed with spring tine in January and February (two operations); harrowed in March, and spring-tined early in April. Sown with a spring-tine drill from 15th to 20th May, with Canberra variety at the one setting, 56 lb. per acre.

On 22nd August all varieties were healthy, Canberra, Clarendon, and Waratah 15 inches high, Riverina 1 foot, Aussie 9 inches, and Wandilla 6 inches. Hard Federation, Queen Fan, and Marshall's No. 3 (the least) had less growth, and the foliage was procumbent. All continued healthy until 4th November, when flag and stem rust made its appearance, and continued to affect the crop until mature, about 14th November.

Queen Fan was most affected by rust, Marshall's No. 3 and Hard Federation were badly affected, Waratah and Wandilla not so severely, Aussie only slightly, and Clarendon was almost free of rust. The grain was of good quality in Clarendon and Aussie; Riverina, Canberra, and Early Bird were satisfactory; Hard Federation, Queen Fan, Wandilla, and Marshall's No. 3 were badly pinched, the last-mentioned being the poorest sample.

In the fertiliser trials flag smut was very bad, and materially reduced the yield on both the fertilised and unfertilised sections. Yields in bushels per acre :—

Unmanured	18¾	bushels.
Superphosphate, 42 lb. per acre	20¼	,,
,, 50 lb. per acre	22½	,,
,, 72 lb. per acre	25½	,,

Loomberah.—Sloping uplands; soil, red loam with clay subsoil, about 6 to 8 inches from the surface. The land carried wheat in both 1922 and 1923, and was ploughed first week in March about 5 inches deep, and harrowed;

cultivated and harrowed twice during June. Sown (unmanured) with a cultivator drill (combine) on 12th July; harrowed 21st July. Seeding, 55 lb. seed per acre. The plots were not fed off, and did not stool well, but stood up satisfactorily to harvest, making a straw growth of about 3 ft. 6 in. Disease, such as rust and possibly an organism affecting the roots reduced the crop to some extent. Bunt was not noticed in the crop. Prior to the November rains the showing, especially of Wandilla, Clarendon, and Canberra, on the farm was very good, and estimates of 50 bushels per acre were made. The November rains caused practically the whole of the heavy yielding crops to go down, and much loss of grain resulted, partly through the crops not being sufficiently mature when they lodged.

Quirindi.—Somewhat level country, subject to high floods; soil, sedimentary, chocolate coloured, deep, free-working, and friable. Cropped with wheat (unmanured) for grain in 1922; wheat (unmanured) for hay in 1923 (a poor crop); grazed with sheep and cattle until the latter part of March, 1924. Springtooth-cultivated 4 inches deep in March, when soil was dry; again towards the end of April 2½ to 3 inches deep following rain; harrowed 19th May. Sown 20th May with disc drill 1 to 1½ inches deep; no fertiliser was used, and no further cultivation given. Seeding, 51 to 59 lb. per acre. A fair germination resulted, but the crop was not dense enough. At the end of July Early Bird had grown to 1 foot high; Riverina, Currawa, Waratah, Aussie, and Clarendon were nearly as good. On 9th October all were in ear. Loose or flying smut was fairly prevalent in Queen Fan and Currawa. Rust only slightly affected any variety, and chiefly leaf rust.

Waratah gave a good sample, but slightly pinched; cracked considerably in the harvesting. Early Bird yielded a good sample, very slightly pinched, and it only cracked to a minor extent. Queen Fan contained a large percentage of green and soft grain, due to a second growth which this variety made more than any other; it did not thresh as cleanly as the others, and the grain was pinched. Currawa was satisfactory, although slightly pinched; the grain cracked, but less so than Waratah; rare green or immature grains. The Riverina grain was slightly pinched, and badly cracked, the splitting being mainly engthways. Early Bird gave a better sample; like Riverina it is a large grain variety; there were but few grains split or cracked. The Clarendon sample was good, but slightly pinched, cracked, and bleached. Aussie yielded a small well-filled grain, very little cracked. The plots were harvested on 26th and 27th November.

Barraba.—Country falling slightly towards the west; soil, red to grey, fertile clay loam, friable and free-working. Previously cropped with lucerne, which was sown in 1915; no fertiliser added then or since. Prior to ploughing the lucerne plants were thinly distributed, due to drought and close feeding with sheep. Ploughed 5 inches deep from 25th December, 1923, to 7th January, 1924. On 21st January the soil was still in open cloddy condition, notwithstanding that 170 points of rain had fallen since being ploughed, and

moisture was showing at a depth of 2½ inches. Ploughed towards the end of March; disc-harrowed (shallow) end of April. Sown 26th May, seeding 50 lb. per acre, unfertilised. Good germination and stand resulted. Crop not fed off, and no further cultivation after sowing.

On 28th August, Early Bird was 18 inches high, Firbank almost as high. Queen Fan had made the least growth. On 17th October, the whole crop was a dense mass, well in ear, 4 to 5 feet high and healthy, promising 50 bushels per acre.

By November most of the crop had a lean or had lodged. The early-maturing varieties lodged more than the others. There was very little rust or other disease, except in Queen Fan and Firbank, both of which varieties were noticeably rust-affected; Aussie and Clarendon were noticeably free. Early Bird matured mid-November, Riverina, Aussie, and Canberra a week later, then Waratah, Clarendon and Firbank one week later. Marshall's No. 3 and Queen Fan were ready to cut on 11th December. The crop was mostly quite flat when harvested with a combine harvester, and quite half the grain was lost, so that the tabulated yields are not really comparable. The rainfall from 1st January to 25th May was 902 points.

Manilla.—Located on somewhat level uplands that have been subjected to occasional flooding; soil, light red friable loam. Wheat was grown in 1923; soil unfertilised; crop practically a failure, and fed off by stock. The land was ploughed 4 inches deep on 10th January; disc-cultivated in March, and again just prior to sowing. Sown 29th and 30th May, with hoe drill, at the rate of 37 lb. per acre without fertiliser. The stand was on the thin side, but this was made up in some degree by better stooling.

On 16th October all varieties were healthy and not lodged, and about 3 ft. 6 in. high. At maturity the crops averaged in height about 3 ft. 9 in. Early Bird matured on 8th November, Currawa and Waratah, 1st December, and others on 16th November. All varieties stood up well, with the exception of Riverina, which lodged, though not sufficiently to cause loss of grain in harvesting operations. Waratah was tough to thresh. The crop was harvested towards the latter part of November, and early December. The experimenter particularly liked Aussie.

The grain of Riverina was slightly pinched; Aussie slightly bleached, otherwise good; the balance were all good quality. Bushel weights:—Clarendon and Canberra 62, Early Bird 61, Riverina, Currawa, and Aussie 59, Waratah 53. The light weight of Waratah was due mainly to the number of white heads. The whole crop had a healthy, disease-free appearance. Caterpillars devoured the flag during the late stages of maturity, and although the quality of the grain and the weight were slightly affected, the extra space caused thereby increased the air circulation and allayed fungoid development.

Duri.—Upland red loam, with clay subsoil 6 to 12 inches from the surface, and of good water-holding capacity. In 1922 wheat was grown unmanured;

in 1923 the land was fallowed, then grazed by sheep until October, when it was ploughed 5 inches deep. Cultivated with a tine cultivator to the full depth of ploughing on 16th January and shallower on 10th February, 14th March, and 24th April. On 20th April about one-eighth of the area across each plot was skim-ploughed at a shallow depth. Sown with seed drill on 2nd May, seeding about 48 lb. per acre. The variety trial of both wheat and barley was unmanured.

A fertiliser experiment, sown with Aussie variety of wheat, with superphosphate at the rates of 30 lb., 50 lb., and 100 lb. per acre, checked by unmanured sections, was sown on the same date as the variety trial.

Good germination and plant stand resulted. From 14th October to 21st October, the several varieties lodged badly, especially Early Bird, Riverina and Canberra in the wheats, and Cape and Trabut among the barleys. The least lodged was Federation, then Waratah. Rust had also developed considerably. On 5th December the whole field was badly lodged and tangled. The experiment was abandoned for comparison of yields, but there was a promise earlier of a 40-bushel crop. Order of maturity, barley—Trabut, Pryor, Cape. Wheat—Early Bird, Riverina, and Canberra, then Florence, Clarendon, and Aussie about equal, followed by Federation, Waratah, and Marshall's No. 3. There were sections bleached and scalded on stem and ear (possibly due to rain storms in the daytime, followed by sunlight and heat) and pinched grain, due mainly to an organism destroying the roots, encouraged by the wet conditions. The wheat and barley were free from bunt.

Armidale.—Sloping uplands. Soil, a black self-mulching loam of basaltic origin. Previous crop oats, in both 1922 and 1923, when the land was unmanured. Ploughed 6 to 7 inches deep during the first week in March, when the soil was somewhat dry; harrowed the third week in April, and shortly after ploughed three inches deep, to destroy a sprinkling of oat plants; then harrowed, rolled, and sown on 8th May in a moist seed-bed, at the rate of 80 lb. per acre, no fertiliser being applied. A good stand resulted. On 9th September both Cleveland and Zealand had much less growth than the other varieties, and also a finer stem growth. Florence had made better growth than Firbank. The growth of Genoa was also good.

By 9th December considerable lodging had occurred. Harvesting commenced on 15th December, but owing to the tangled condition comparable yields were not possible with the usual harvesting machinery. Zealand and Firbank were badly damaged by rust, and the grain very pinched. Cleveland made the best sample of hay, having green colour for a greater percentage of stem than any other variety. Genoa was the next best hay wheat. Florence, which had the shortest growth, was the earliest maturing variety, and was fit to cut and bind for threshing on 15th December It was estimated to yield 40 bushels per acre, and was harvested for grain. This variety was very free from rust.

Murrumbidgee Irrigation Areas. (Griffith Centre).

E. B. FURBY, H.D.A., Agricultural Instructor.

Experiments with wheat and oats were conducted in the district during 1924, with the co-operation of the following settlers:—

A. G. Kubank, Farm 101, Griffith.
J. Fuke, Farm 1622, Yenda.
J. Lyne, Farm 1636, Yenda.
F. Butler, Farm 1645, Yenda.
A. M. Burns, Farm 1641, Yenda.

These plots were arranged primarily for hay purposes, and included variety and manurial trials on the main types of soils largely devoted to the production of hay in this district. It was found, however, that the results from many of the plots had to be totally disregarded, on account of the crops being damaged to such an extent at harvest time by heavy rains that even reasonably accurate figures could not be secured. The oat crops generally throughout the district suffered particularly heavy damage, and many acres were abandoned as hopeless to harvest. Rain also delayed harvesting, and in several cases it was found preferable to allow the wheat crops to ripen and to strip them, rather than convert them into poor quality hay. In view of this, the main objective of the trials was not achieved in its entirety.

Early in the season prospects of good crops throughout the district were very bright, ample rain falling during the winter and early spring to maintain a good steady growth. It was found in the month of November that a general watering was required, and before it was completed an unseasonable fall of 5 inches of rain came, producing the conditions of a general flood.

Over the growing period of the crop the official records at Griffith show that the following rain was recorded:— May, 94 points; June, 150; July, 54; August, 180; September, 115; October, 76; November, 494 points. Total, 10·63 inches.

It is generally understood that more rain fell around Yenda than was the case at Griffith.

The plots harvested, and from which results were obtained were:—

Farm 101—Wheat varieties, stripped.
,, 1622— ,, ,, cut for hay.
,, 1641— ,, manurial experiment, stripped.
,, 1622—Oat varieties, cut for hay.
,, 1645— ,, ,, ,,

Farm 101.—The soil on this farm was boree, a heavy soil typical of a large portion of the area, somewhat "crab-holey," very flat, and subject to flooding and consequent damage to crop. The previous crop grown was wheat for hay, yielding approximately 2 tons per acre, the stubble of which was grazed off with sheep. In getting the ground ready for sowing, the practice usually found very satisfactory on this farm was adopted. The land was watered in March, and disc-ploughed to a depth of 4 inches. A second ploughing to a

depth of 3 inches in the third week in April, followed by a smoothing, completed the tillage, leaving the ground loose and fine to a depth of 2 inches, but somewhat dry. Sowing was done on 25th April, a log being dragged behind the drill to cover the seed, and to slightly compact the bed. Seed was sown at 51 lb. per acre, and superphosphate at ½ cwt. per acre.

Germination was only fairly satisfactory, but aided by good showers later good growth resulted. Rust was manifest in the crop after the heavy rains in November, but did not seriously affect it.

Two irrigations were given the growing crop, one in August and one early in November.

Most of the varieties suffered loss as the result of the rain, more particularly the early-maturing varieties, such as Clarendon, Firbank, Gresley, and Aussie, while of the late varieties Zealand was the only one to go down badly.

From Gresley a very good sample of grain was taken, and in view of the poor germination of this variety, the yield was surprising. Under good conditions this variety should prove very valuable. Aussie, an early variety, showed no promise as a hay variety, but produced a nice sample of grain, which, though small, was plump and even. Queen Fan, a late variety and a good stooler, gave small pinched grain. It stood up well to the weather. Major was an outstanding variety, yielding much beyond expectations. It stood up well, and is worthy of further trial for hay and grain. Marshall's No. 3 and Yandilla King maintained their reputation as good all-round varieties, whilst Wandilla can be ranked with these two varieties as being suitable for hay or grain on the areas.

The yields obtained were as follows:—

	bus.	lb.		bus.	lb.
Major	22	43	Aussie	16	44
Wandilla	20	56	Zealand	15	55
Yandilla King ...	20	41	Clarendon	15	5
Marshall's No. 3 ...	20	23	Queen Fan	14	55
Gresley	19	41	Firbank	12	44

Farm 1641.—The manurial trial with wheat on this farm was on heavy red loam, bordering on grey, "crab-holey" soil. The previous crop was barley, which was fed off with sheep. The ground was watered in March, and ploughed deeply with disc plough, turning up very rough. It was harrowed twice before sowing, and once after to cover the seed. Sowing was carried out on 19th May, Marshall's No. 3 being used at 55 lb. per acre, and superphosphate in varying quantities. The results from the plot were as follows:—

	lb.	Yield per acre. bus.	lb.
1. Superphosphate, per acre.—	122	12	0
2. " "	91	13	30
3. " "	66	15	0
4. " "	30	18	0
5. No manure ...		18	0

As the yields here decrease almost in proportion to the increase in manure used, it is well to point out that there is a large degree of error in the accuracy of the results, as on the more heavily manured portions there appeared to be

more crop damage by storms than on the other plots. All through the season the most heavily manured plots showed up to advantage, as did also plots tried on other soils, but the results do appear to indicate that even too much manure can be used on winter cereals, and that further experiment is necessary to determine the correct amount to use.

Farm 1622 (Wheat).—The soil cropped here was red loam, slightly above the average used for cropping on these areas. After the previous crop of wheaten hay was removed, the ground was disc-ploughed and short-fallowed till March, when it was again disc-ploughed; it was next harrowed in April, following a good fall of rain, and the seed was sown on 22nd April in a very efficient seed-bed. A splendid germination resulted, and the crop grew well during the season.

The seed was treated with dry copper carbonate for smut, and it is interesting to note that it germinated fully a week earlier than wet pickled seed sown at the same time on the same ground.

Superphosphate at 56 lb. per acre was sown in all plots. The crop was irrigated once in the spring time, in early September.

As will be seen by the yields, some very good results were obtained, an outstanding feature of the trial being the comparatively low yields of the early-maturing varieties. This bears out previous experience in this regard for the district. Of the new varieties tried here for hay, Major and Wandilla stand out, having shown that both produce good quality hay. Queen Fan proved to be rather coarse strawed and of bad colour. Riverina, a very early variety but poor stooler, seems to be a promising hay variety, having fair straw length with fineness.

The yields of hay were as follows:—

Variety.	Yield.				Variety.	Yield.			
	t.	cwt.	qr.	lb.		t.	cwt.	qr.	lb.
Yandilla King	2	5	1	14	Aussie...	1	12	1	15
Marshall's No. 3	2	2	1	6	Queen Fan	1	11	0	11
Zealand	1	17	0	18	Clarendon	1	7	0	1
Major	1	15	2	2	Riverina	1	7	0	0
Wandilla	1	12	3	25	Gresley	1	6	1	2

Farm 1622 (Oats).—The soil and method of preparing it were similar to that of the wheat plots on this farm. The crop was sown under ideal conditions on 29th April, and harrowed after sowing. Superphosphate at 56 lb. per acre was used, giving the crop a good start; it afterwards grew very well, resulting in some heavy yields being obtained, particularly from Yarran and Ruakura. Yarran is a late variety, which showed promise of being a good hay variety on this class of soil, besides standing up well to the bad weather. Fulghum, tried here for the first time, is a variety that could be grown with confidence. It is very early, stools well, and has good straw colour. Mulga was disappointing in this plot, as during the season it appeared to be the

best variety. Whereas other varieties were badly rusted after the rain, Mulga remained comparatively free. The rate of sowing on these plots was 60 lb. per acre.

Farm 1645.—On this farm the soil was grey or white "crab-holey" clay, very difficult to water and work efficiently on account of its uneven nature; but it is capable of producing very heavy crops under good management. Previously a crop of oats had been grown, which was cut for hay. The ground was disc-ploughed in January, watered the first week in April, followed by a springtooth-cultivation to a depth of 4 inches. At sowing on 20th May a very good seed-bed was available. Superphosphate at 60 lb. per acre was used. Germination was slightly impaired, owing to rain falling just as sowing was completed, and forming a crust on the surface. However, very satisfactory yields were obtained in view of the fact that much of the crop had lodged. Two irrigations were given in the springtime, one on 20th September and the other early in November.

On this soil the outstanding variety was Mulga, which grew tallest and gave the highest yield. Algerian, however, though not well up in the list, cannot be disregarded as a very desirable type of oat here. This variety stood up perhaps better than all others to the bad weather on this heavy, forcing class of land. Yarran, a late variety, also withstood the weather, and by the quality of hay it made should be regarded as worthy of consideration as a suitable hay variety for the district. The rate of sowing on these plots was 70 lb. per acre.

The yields of oats for hay on the last two farms were as follows:—

Variety.	Farm 1622.				Farm 1645.			
	t.	cwt.	qr.	lb.	t.	cwt.	qr.	lb.
Yarran	2	6	0	8	1	16	1	20
Ruakura	2	4	2	8	1	16	0	8
Guyra	1	18	2	23	1	13	0	0
Fulghum	1	15	2	20	1	4	0	16
Algerian	1	14	2	4	1	14	2	16
Mulga	1	7	1	6	2	0	3	16

"Irrigation Farming in New South Wales."

Farmers' Bulletin, No. 148, with the above as its title and subject, is to hand from the printer and is available to those who are interested.

The bulletin has been compiled from articles contributed by Mr. A. N. Shepherd, H.D.A., Senior Agricultural Instructor at Leeton, to the *Agricultural Gazette* last year, but a good deal of new matter has been added and the bulletin now covers nearly sixty pages. It states briefly and in quite popular terms the methods by which an area of land may be prepared for irrigation, and the principles on which it should be worked to maintain fertility. Crops suitable for hay and green fodder (such as the small cereals, lucerne, maize, sorghums, &c.) are dealt with at length, and also vegetables, cotton, rice, and so forth, and a short section on silage will be found useful.

Obtainable from the Government Printer, Sydney, at 9d. per copy; 1d. postage extra.

Varieties of Wheat and Other Cereals.

DEPARTMENTAL RECOMMENDATIONS FOR DIFFERENT DISTRICTS.

A. H. E. McDONALD, H.D.A., Chief Inspector of Agriculture.

THE following are the latest departmental recommendations as to the varieties of wheats, oats and barley best suited to various portions of the State:—

WHEAT.

Coastal Districts.

[Embracing districts which are specially subject to rust.]

For Hay—

Clarendon, Florence, Firbank, Thew (early maturing varieties).

For Green Fodder—

Gresley, Florence, Firbank (early maturing varieties);
Huguenot (mid season maturing).

Sowing for hay should be made later than for green fodder.

Northern Tableland.

[Of which Glen Innes is representative.]

For Grain or Hay—

Genoa (early sowing);
Florence (mid-season and late sowing);
Clarendon (mid season and late sowing).

For Green Fodder—

Florence (early, mid-season, and late sowing).
Clarendon (early, mid-season, and late sowing).

Central Tableland.

[Of which Bathurst is representative.]

For Grain or Hay—

Cleveland (early and mid-season sowing);
Yandilla King (early and mid-season sowing);
Florence (mid-season and late sowing);
Gresley (mid-season and late sowing).

For Grain Only—

Federation (mid-season sowing);
Canberra (mid-season and late sowing).

Southern Tableland.

[Of which the Monaro, Crookwell, and Batlow districts are representative.]

For Grain or Hay—

Cleveland (early sowing);
Yandilla King (early sowing).

South-western Slopes and Riverina.

[Of which Wagga and Temora are representative.]

For Grain or Hay—

Yandilla King (early sowing);
Marshall's No 3 (early sowing);
Wandilla (early sowing);
Gresley (mid-season and late sowing);
Waratah (mid-season and late sowing).

For Grain only—

Federation (early and mid-season sowing);
Canberra (late sowing).

For Hay only—

Zealand (early sowing);
Firbank (mid-season and late sowing).

Central-western Slopes.

[Of which Dubbo, Gilgandra, Wellington, Cowra, Grenfell, Forbes, and Parkes are representative.]

For Grain or Hay—

Cleveland (early sowing), especially suitable for the cooler portions of this district, such as Mudgee;
Yandilla King (early and mid-season sowing);
Gresley (mid-season and late sowing);
Waratah (mid-season and late sowing).

For Grain only

Federation (early and mid-season sowing);
Clarendon (mid-season and late sowing);
Canberra (late sowing).

For Hay only—

Firbank (mid-season sowing).

North-western Slopes.

[Of which Tamworth and Gunnedah are representative.]

For Grain or Hay—

Cleveland (early and mid-season sowing), especially suitable for the cooler portions of this district, such as Inverell and Delungra
Currawa (early and mid-season sowing);
Yandilla King (early and mid-season sowing);
Waratah (early and mid-season sowing);
Gresley (mid-season sowing).
Clarendon (late sowing);
Florence (late sowing);

For Grain only—

Hard Federation (mid-season and late sowing);
Canberra (mid-season and late sowing).

Black Soil Plains.

[Of which Coonamble is representative.]

For Grain or Hay—

Canberra (mid-season sowing);
Florence (mid-season and late sowing);
Clarendon (mid-season and late sowing).

Western Plains.

[Of which Trangie, Nyngan, and Condobolin are representative.]

For Grain or Hay—

Improved Steinwedel (mid-season sowing);
Clarendon (mid-season sowing);
Canberra (mid-season sowing);
Florence (mid-season sowing);
Gresley (mid-season sowing);
Firbank (mid-season and late sowing).

Murrumbidgee Irrigation Areas.

For Hay on the Irrigation Areas—

Marshall's No. 3 (early sowing);
Yandilla King (early sowing);
Zealand (early sowing);
Firbank (mid-season and late sowing);
Gresley (mid-season and late sowing).

For Grain on Dry Areas—

Federation (early and mid-season sowing);
Yandilla King (early and mid-season sowing);
Canberra (mid-season and late sowing).

OATS.

The varieties of oats recommended for various districts are as follows:—

Coastal.—Algerian, Sunrise, Mulga, Myall.

Central Tableland.—Algerian, Guyra, Lachlan, Yarran, Wilga.

Northern Tableland.—Algerian, White Tartarian, Guyra, Sunrise, Lachlan, Mulga.

Southern Tablelands.—Algerian, Mulga, Yarran, Guyra.

Monaro.—Algerian, Mulga, White Tartarian.

South-western Slopes and Riverina.—Algerian, Sunrise, Mulga, Lachlan.

Central-western Slopes.—Algerian, Sunrise, Lachlan, Mulga.

North-western Slopes.—Sunrise, Mulga.

Irrigation Areas.—Algerian, Sunrise, Mulga, Guyra.

Western Plains.—Sunrise and Mulga.

BARLEY.

Following are the Departmental recommendations as to barley :—

Two-row type (commonly called "malting barleys").—Standwell and Pryor for districts similar to Bathurst, and Kinver, Golden Grain, Pryor, and Goldthorpe for climates similar to Wagga.

Six-row type (commonly called "feed barleys").—Skinless for green fodder for winter. Malebo is also recommended for trial. Cape, Trabut, and Reka for green fodder, and grain for stock in the cooler districts. Skinless and Cape for green fodder in coastal districts.

A Revised List of Publications.

The "List of Publications" of the Department of Agriculture has been revised down to January, 1925, and copies are now available. The list, which occupies twenty-four pages, is divided into two parts—the first detailing all the sale publications of the Department, and the second part giving the titles of the free publications classified according to subject.

As to the free publications, it is perhaps timely to point out that the Department's offer is somewhat limited. It is only those publications that are likely to be useful to a farmer in his own work that are free. Where a large number of leaflets on a variety of subjects is asked for it is but reasonable that they should be paid for.

Government Stock of Italian Bees Available.

Considerable attention is being given by the Department of Agriculture to the improvement of strains of bees in the State, and for this purpose twelve leather-coloured Italian queens were imported from a reputable Italian breeder in September of last year. All queens landed safely but two died shortly after arrival. The remainder have been distributed among notable breeders in various parts of the State, Wauchope Government Apiary, and Hawkesbury Agricultural College.

The results obtained from those at the two Government apiaries have exceeded all expectations in quality. The stamina and storing qualities of the strain are excellent, and the progeny of the queens, which have already been used largely in re-queening throughout the apiaries, have given splendid results in honey production. A notable feature of the new stock is their tractability, which is very marked.

The conditions for breeding and honey production this summer have been very favourable, and the demand for progeny of imported stock indicates a desire on the part of apiarists to improve their stocks.

Full particulars may be obtained by anyone who would like a nucleus colony from these queens, upon application to the Under Secretary and Director of Agriculture, Sydney.

Farmers' Experiment Plots.

WINTER GREEN FODDER EXPERIMENTS, 1924.

Northern District.

MARK H. REYNOLDS, H.D.A., Senior Agricultural Instructor.

FIVE farmers co-operated with the Department in winter fodder experiments in 1924. Plots were conducted by Mr. J. Hill, of Guyra, with Algerian oats, combined with two varieties of vetches and mustard, especially to ascertain the effect upon a succeeding spring planting of potatoes; by Mr. J. Chick, Tenterfield, with two varieties of rye for cow feed; by Mr. H. Manser, Sunnyside, with barley for winter feed for sheep; by Mr. H. A. D. Crossman, Quirindi, with wheat, oats, rye and barley for cow feed; and by Messrs. Johnston Bros., Aberdeen, with oats and barley for cow feed. A fertiliser trial was also conducted at the last-mentioned centre. Except at Guyra, the plots were a success and the demonstrations impressed the experimenters favourably.

RAINFALL RECORDS.

	Aberdeen.	Quirindi.	Sunnyside and Tenterfield.
1923.	Points.	Points.	Points.
April	......	210	......
May	49	111	108
June	65	130	133
July	172	194	218
August	25	145	148
September	288	240	226

Details of Plots.

Johnston Bros., Dartbrook, Aberdeen.—Uplands somewhat level. Soil a light reddish to grey loam, overlying boulder clay subsoil about 6 inches from the surface; free-working, slight tendency to run together. Natural pasture until winter of 1923, when the land was ploughed for sowing in the early spring with Hungarian millet (without fertiliser). A poor stand and growth resulting, the crop was fed off by cows.

The section occupied by the oat variety trial and a cross-section of the manurial trial were shallow-ploughed early in September, 1923; the barley section was ploughed shortly after, together with the balance of the manurial section. During the first week in February the first-mentioned section was again ploughed 5 to 6 inches deep, but the barley and a cross-section of the manurial trial previously mentioned were not ploughed a second time until March, owing to the hardness of the soil. A portion of the fertiliser trial was located on land not cultivated comparably with the foregoing, and the results from this section are not included.

The whole section was cultivated with a springtooth cultivator twice—the first time to the depth of the ploughing, as far as possible, and the second (about mid-March and just prior to seeding) shallower. Sowing was done on 28th and 29th April, 1924, with a disc drill. The worn and unreliable condition of the drill was responsible for variations in the seeding, the rates per acre of which were as follows:—Ruakura oats, 73 lb.; Yarran oats, 50 lb.; Sunrise oats, 67 lb.; oats and vetches combined, 45 and 55 lb. respectively; Trabut barley, 91 lb.; Skinless barley, 116 lb.; Prior barley, 60 lb.; Cape barley, 33 lb; Cape barley and vetches, 49 lb. of each. Germination was satisfactory, and the plants were sufficiently distributed to provide a good density in the crop. The autumn and winter growth was vigorous, but the dry spring checked it.

On 26th September, on the Ruakura oats and vetches plot, the oats had attained a height of 3 feet 3 inches, and, with the exception of a few small patches, were standing up well, the ear well out of shot blades. The vetches were quite dead and flat on the ground. They had germinated well and made good growth to a height of about a foot. In the weighing the vetches did not add to the bulk.

The foregoing remarks as to the oats apply to the plot in which Ruakura oats only were sown.

Yarran oats reached a height of 3 feet 3 inches. They were in ear, but not as mature as Ruakura, and did not stool as well, but were standing up well.

Sunrise oats were 3 feet 3 inches high, and were the earliest maturing of the oats on trial. They were still green, as was the foliage of all the foregoing varieties of oats, with the grain fully formed, but milky, and were standing up well.

Trabut barley was of a uniform height of 3 feet. It was a dense crop and standing up well, but not as mature as the oats. The ear was 1 inch clear of the shot blade; the grain formed but milky, and all the foliage still green.

Skinless barley was 2 feet 9 inches high. It was more mature than the Trabut barley and the oats. The grain was in the early dough stage, and the flag on the lower portions of the stem dead or wilting. The stooling was poor, possibly owing to liberal seeding.

Prior barley was 2 feet 3 inches high. It was more vigorous and stooled better than the Skinless. It was well in ear, with the grain in the dough stage, and slightly over-mature for green feed.

Cape barley was 22 inches high. It was a little later in maturing than Prior (about as mature as Skinless); 50 per cent. of the flag on the lower portion of the plants was wilted.

In the Cape barley and vetches plot growth of the barley was similar to that in the barley plot. The vetches made a good stand, attaining a height of about a foot, but were dead and mostly broken up and flat on the ground by the date referred to. They did not add to the bulk of the fodder.

All the barleys stood up well. The whole of the crops were free from rust or smut, and had a healthy green appearance, except that as mentioned the lower flag had died on some of the varieties of barley. The comparatively better growth of a strip of barley adjoining the oats was evidence that the barleys generally were grown under less favourable conditions than the oats. The oats and barley yields should therefore not be compared in an effort to arrive at which of these classes of crop produces the most green fodder.

Algerian oats were sown in the fertiliser trial and healthy growth resulted on all plots.

The yields per acre in the variety trial were as follows: Ruakura oats, 12 tons 8 cwt.; Ruakura oats and vetches, 14 tons 10 cwt.; Yarran oats, 10 tons 5 cwt.; Sunrise oats, 10 tons 5 cwt.; Trabut barley, 11 tons 6 cwt.; Prior barley, 4 tons; Skinless barley, 4 tons; Cape barley, 4 tons 18 cwt.; Cape barley and vetches, 5 tons 4 cwt.

Following are the results in the manurial trial: M7 mixture, 12 tons 9 cwt; M4, 11 tons 18 cwt.; unmanured, 10 tons 12 cwt. M4 mixture consists of two parts of sulphate of ammonia and five parts of superphosphate; it was applied at the rate of 138 lb. per acre. M7 consists of three parts chloride of potash to ten parts superphosphate; it was applied at the rate of 129 lb. per acre. On another section a plot manured with M12 mixture yielded one-fifth more than the unmanured. M12 consists of four parts sulphate of ammonia, ten parts superphosphate, and three parts chloride of potash; it was applied at the rate of 168 lb. per acre.

In computing the benefit of the manure, consideration must be given to the residual effect. An instance has been reported recently of increased yields in the fourth year after the addition of superphosphate, and the increased feeding value from fertilised sections is an established fact.

H. A. D. Crossman, Borambil, Quirindi.—Uplands rarely subject to flooding; soil a black, self-mulching loam of considerable depth, but which gradually changes as it deepens to a more impervious condition. Previous crop Federation wheat (unmanured) in 1923. Stripped for grain. Yield about 9 bushels per acre; straw cut with mower and carted off field for stock. Ploughed in preparation for the experiment, 24th and 25th January, 5 to 6 inches deep; springtooth-cultivated 4 inches deep, 1st March; harrowed, 7th April; springtooth-cultivated 2½ to 3 inches deep, 14th April. The seed was drilled in on 16th April at the following rates per acre: Hard Federation, 52 lb.; Florence wheat, 52 lb.; Slav rye, 64 lb.; Black Winter rye, 63 lb.; Yarran oats, 47 lb.; Mulga oats, 57 lb.; Cape barley, 66 lb. A good germination and plant stand resulted, except in the case of the Slav rye. With this exception, all the seed was treated with dry copper carbonate for bunt prevention. The seed was sown in a moist seed-bed, as far as possible at the same depth. The Slav rye plants were first above ground; then Hard Federation wheat and Black Winter rye on 25th April, Florence wheat on 26th, and Yarran oats, Mulga oats, and Cape barley on 28th April.

The whole field was harrowed on 19th April. Portion of the crop was not fed off; another portion was fed off until 16th August; and the balance (about 6 acres) was grazed by cattle from time to time until 10th December, when the crop was still green. The whole field was harrowed on 16th August. The total area sown, which was enclosed by a fence, was 7 acres. Although the crop on 6 acres was fed off prior to 27th July, a record kept from this date until 11th October showed that for this period one cow was fed continuously on every 2 acres. The stock showed preference to the slowest-growing crops, but ultimately consumed the lot.

The sections of rye which had not been fed off were weighed up on 5th September. They were well in ear and 4 to 5 feet high. On the same date the Florence wheat was estimated ; it was a much denser crop, well in ear and about 2 feet 6 inches high. The barley was 2 to 3 feet high. It was not fully in ear; it was estimated that it would be fit a week later. The Mulga oats were 2 feet 6 inches high and well in ear, but the grain was not set. It was considered that they would be fit to estimate in about ten days. The Yarran oats and Hard Federation wheat were 2 feet and 18 inches in height respectively, and both coming into ear. The crops were generally healthy in the early stages, though a few plants in the rye showed take-all, and aphis was noticed—on these plants mainly. In the more mature stages the effect of root rot was noticed in the Hard Federation. The yields of green fodder per acre from the sections which had not been fed off were as follows : Florence wheat, 7 tons 14 cwt.; Black Winter rye, 7 tons 6 cwt.; Slav rye, 5 tons 9 cwt. A section of the rye plot that was fed off until 16th August was cut and weighed 9th October, and yielded 3 tons 8 cwt. The green weights of the balance of the varieties were mislaid, but they would approximate that of Florence wheat. Yarran oats may prove too late maturing for an average season. On 28th November the barley, Slav rye, and Black Winter rye that had been fed off until 16th August were harvested for grain, and yielded respectively 13, 10 and 8 bushels per acre. It was estimated that one-third of the rye, and half of the barley seed still remained on the plots after the machine had been over them.

J. Hill, Guyra.—Upland undulating country; soil a red basaltic loam, with more impervious clay loam about a foot from the surface. Previous crop oats, in 1923, with superphosphate at the rate of 70 lb. per acre. Ploughed early autumn and cultivated. Oats and oats and Black vetches were sown in April, and oats and mustard, and oats and golden vetches in June, all without manure, at the rate of 1½ bushels of oats and 20 lb. of the other seed per acre. There was a deficiency of moisture in the soil about the time of sowing, but sufficient throughout the growing period, and heavy frosts killed off the April-sown vetches shortly after they appeared. On 19th August only a few plants of mustard or vetches had survived the winter, and the oats were very thinly distributed. On 24th of October the few oat plants were about 6 inches high, and scarcely any plants of vetch were to be seen. The land was then being ploughed in preparation for potatoes. The section

of land on which the plots were located is not considered markedly inferior to other portions of the arable land, and the cause of the poor growth of the oats cannot be accounted for.

H. Manser, Sunnyside.—Upland undulating land; soil a granitic sandy loam, with clay subsoil about 1 foot from the surface. Previous cropping; maize, 1922, fertilised with a proprietary fertiliser at the rate of 1 cwt. per acre; oats, 1923, unmanured, fed off by sheep. Springtooth-cultivated both ways about mid-January, 1924; ploughed 5 to 6 inches deep in March. Sown at the rate of 1¼ bushels per acre by broadcasting on 21st May on the rough-ploughed land, and well harrowed. On 2nd June the plants were showing above the surface, and with the exception of Skinless a good stand resulted.

There was not much growth until early September, when the crops generally were about 8 inches high. Trabut proved a better stooler than Prior. Cape made a sturdier growth and also stooled well. Skinless was the coarsest in stem; it had very broad flag and stooled fairly. On 21st September the Prior was coming into ear, and was about 1 foot high. Trabut was not quite as mature, but the ear was peeping, and it was about 10 inches high. The Cape showed no sign of ear, but was more flaggy. The Skinless was at about the same stage of maturity as the Cape, and of about the same height, viz., 9 inches.

The paddock of 9 acres where the barley was located was cropped with 4 acres of barley, 2 acres natural pasture, and 3 acres of wheat. On 21st September 140 ewes were turned into the paddock, the height of the crop then averaging about 10 inches. The sheep first took to the Skinless barley, and touched practically nothing else until they had eaten it bare, which took a week. They next cleaned up the Cape Barley (in about another week), and they had no further preference, spreading out over the rest of the crop. At the time the wheat had tillered, but there was no sign of ear. The sheep remained in the paddock until 14th November, a period of seven and a half weeks. They had the run of an adjoining paddock of natural pasture (somewhat bare), containing water, but they always returned to the crop as soon as they had had a drink.

J. Chick, Tenterfield.—Uplands, sloping gently; soil a granitic sandy loam. Previous crop, maize, 1923, fertilised with different mixtures at the rate of about 1 cwt. to the acre on portion of the experiment section. Cows were turned on the section and cleaned up the bulk of the cornstalks, and the land was ploughed 6 inches deep on 18th April. Sown without fertiliser at the rate of 2 bushels per acre in a moist seed-bed by broadcasting, and twice harrowed to consolidate the land and cover the seed.

Sections of the crop that had not been fed off were cut and weighed on 22nd of August, when the crop was well in ear, but still quite green, the yields being: Black Winter rye, 4 tons 14 cwt. per acre; Slav rye, 6 tons 5 cwt. per acre. Two further cuttings were obtained about equal to the foregoing,

and on 12th December the crop was 15 inches high and still green. On a portion which had not been fed off, the average height of which was 3 feet 9 inches, with the crop almost dry and the grain practically mature, but pinched, the yield per acre on 12th December was 3 tons.

This trial demonstrates that considerably more fodder is produced per acre by feeding off or cutting from time to time than by allowing the crop to mature without feeding off or cutting during the growing period. The varieties both stood up well and were free from disease.

Murrumbidgee Irrigation Areas (Yanco Centre).

A. N. SHEPHERD, H.D.A., Senior Agricultural Instructor.

During the season 1924 the following farmers co-operated with the Department in the carrying out of green fodder trials:—

W. Playford, Farm 336, Leeton;
W. Edwards, Farm 367, Leeton;
R. Farrar, Farm, 796, Leeton;
A. Marshall, Farm 732, Leeton;
Houghton Bros., Farm 918, Leeton.

The season was marked by good early rains to give the crop a good start, followed by very severe frosts during the latter half of June and the first half of July. For a period of thirty-one days the mean minimum reading was 29·6 deg. Fah., the lowest reading being 20·7 deg. on 27th June. These frosts had a bad effect on the crop, and greatly reduced their rate o growing.

The rainfall registrations were as follows: April, 211 points; May, 104 June, 191; July, 76; and August, 225 points. It will be seen that no great benefit was derived by the crops during their early growth, following the fall which gave a good germination. The result was that, taken all round, the yields were lighter than usual, and also a little later. It may be said that these winter crops lend themselves for the conservation of fodder, as they are more easily grown than the summer crops, will grow on less fertile land than maize, and are less costly to handle.

The Plots.

Farm 336.—A manurial trial was sown on this farm on 23rd April. The soil varied from a fair sandy loam to heavy red clay. This resulted in big differences in yields, the superphosphate plots being incomparably ahead of the other mixtures. The crop consisted of a mixture of Sunrise oats and vetches at the respective sowing rates of 2 bushels of the former and 20 lb. of the latter. A very good germination was obtained, but the vetches grew very poorly, and at cutting time were very thin throughout the crop.

Farm 367.—On this farm the trial consisted of a manurial test with Mulga oats and vetches, the rates of seeding being the same as in the above

plot. The soil was heavy red clay, and the date of sowing 14th April. The land had previously carried maize in 1921. It was ploughed in the spring of 1923, cultivated during summer, and then cultivated, harrowed, and sown. The germination was fair. The plot with the heavy dressing of superphosphate showed to advantage throughout.

Farm 796.—This plot was sown on grey soil on the 19th April. It consisted of a manurial trial with Sunrise oats and vetches, the seeding being at the same rate as in the previous instances. The previous crop had been barley, with 70 lb. superphosphate per acre. The land was ploughed in February and March, and irrigated previous to sowing. A good germination was obtained, and a heavy return resulted, the watering before sowing greatly assisting.

Farm 732.—A variety trial with barley, oats, and wheat, sown in conjunction with vetches on 14th April, was carried out on red and grey loam. The land had been fallowed since spring, cultivated in March, irrigated, disced, sown, and harrowed. A splendid germination was obtained, and the crop made very quick growth until it was checked by the heavy frosts in June.

Farm 918.—This plot consisted of heavy grey soil—boree country—and was sown with a variety trial of oats and wheat in conjunction with vetches, at the same rates as with the other plots.

The previous crop had been sorghum fertilised with 70 lb. of superphosphate two years back. The land was ploughed in February, watered, cultivated, disced, and harrowed, then drilled on 25th April, and followed with harrows. Good germination followed, but the growth was rather slow. In both cases, with the variety trials, superphosphate at the rate of 1 cwt. per acre was used.

The yields were as follows :—

Fertiliser per Acre.	Farm 336.	Farm 867.	Farm 796.
	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.
Superphosphate, 280 lb. ...	9 13 3 22	6 6 2 14	10 12 0 16
Superphosphate, 140 lb. ...	9 11 3 11	4 13 2 20	10 2 2 6
M13, 182 lb.	4 1 3 22	4 1 2 7	10 0 2 15
M5, 210 lb.	4 1 1 23	4 6 2 0	11 1 2 20
P7, 126 lb.	3 10 2 8	4 4 3 1	10 1 3 6

	Farm 732.	Farm 918.
	t. c. q. lb.	t. c. q. lb.
Sunrise oats and vetches ...	9 1 0 11	7 8 0 18
Trabut barley and vetches ..	9 0 0 12	....
Lachlan oats and vetches ...	8 17 1 11	....
Black Winter rye and vetches...	7 1 0 0	....
Mulga oats and vetches... ...	7 2 3 5	6 16 3 10
Clarendon wheat and vetches ...	6 16 2 20	....
Firbank wheat and vetches ...	5 6 1 7	5 16 3 1
Yarran oats and vetches ...	... .	7 2 2 14

South Coast.

R. N. MAKIN, Senior Agricultural Instructor.

Interesting information respecting the value of certain varieties of oats was gained last year on the farmers' experiment plots sown for green fodder. The following farmers co-operated with the Department in carrying out the work :—

J. Childs, Camden.
J. Henry, Bolong.
Moffit Bros., Bega.
C. T. Hindmarsh, Gerringong.
J. A. Martin, Pambula.
A. Chittick, Kangaroo Valley.
G. H. Faulks, Moss Vale.
L. Evans, Dapto.
L. Garrad, Milton.
C. M. Bate, Bodalla.
J. Timbs, Albion Park.

Weather conditions were against the last two plots, which were ultimately ploughed out.

The South Coast experienced an exceedingly dry winter and spring, but autumn rains were good. Germination was excellent and the early growth was good. It was checked, however, in some cases (especially at Bodalla) by severe frost. It is many years since frosts of such frequency and severity were registered in this district. The rainfall shown in the accompanying table is for the period of growth. More than half fell during February, March, and April. The types of soil varied, according to the locality, between basalt, granite, and sandstone formations. There was no new ground under crop.

It was impossible in a number of cases to obtain the returns from the individual crops, as they attained maturity. In these cases the plots were cut when the latest crop had matured, discounting the value of the experiment appreciably, the yields, though included in the appended table, being scarcely comparable. Except at Mittagong, Moss Vale, and Bodalla, where it was drilled, the seed was sown broadcast, at the rate of 2 bushels per acre, with superphosphate at the rate of 2 cwt. per acre, also broadcasted.

The most interesting of these plots was that on Mr. J. Child's farm, Mount Hunter, Camden, where, on account of its location, it was possible to give close attention to the harvesting of the different varieties of crop as they matured. The plot was situated on a flat formed from sandstone, and faced the main road to Burragorang. The ground had not been under crop for several years. It was ploughed and harrowed prior to sowing, and had no special treatment. The crops germinated well and grew very evenly. The first to mature was Florence wheat, which was cut on 17th July. The next was Mulga oats, cut 24th July. This section attracted a great deal of attention from farmers and others, and the result has been a strong demand

YIELDS (per acre) of Wheat, Oats and Barley Varieties for Green Fodder.

—	Bolong.	Camden.	Bega.	Gerringong.	Pambula.	Kangaroo Valley.	Moss Vale.	Dapto.	Milton.
Rainfall	2,201 points.	1,670 points.	2,261 points.	1,262 points.	1,132 points.	1,393 points.	1,775 points.	......	3240 points.
Sown	23rd April.	24th March.	21st March.	28th April.	26th March.	19th April.	26th March.	6th May.	27th March.
Harvested	27th Sept.	*	*	*	3rd Oct.	2nd Oct.	21st Oct.	1st Oct.	*
Wheat—	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.
Florence	9 8 2 8	8 11 1 20	6 12 0 0	8 5 2 24	3 14 1 4	4 5 2 24	2 8 2 8	3 8 2 8	2 9 1 4
Firbank	8 11 1 8	9 5 2 24	5 17 3 12	7 2 3 12	4 5 2 24	3 8 2 7	2 11 1 20	2 15 2 24	3 4 1 4
Gresley	8 10 2 20	8 11 1 20	6 19 0 8	5 14 1 4	3 12 3 8	3 17 0 16	3 0 0 0	3 15 0 0	3 10 2 24
Barwang	....	....	....	4 3 3 12	4 0 0 0	....	....	4 10 0 0	3 4 1 4
Oats—									
Algerian	12 2 3 4	8 2 3 12	10 19 0 8	10 5 2 24	4 7 0 10	3 0 0 0	7 7 2 0	4 15 0 0	4 17 2 20
Fulghum	13 4 0 0	13 17 0 16	10 5 0 0	8 17 0 16	4 14 1 4	4 0 0 0	8 8 1 8	3 10 2 24	2 11 1 20
Guyra	12 14 2 8	15 0 0 0	10 7 1 20	10 11 1 24	3 11 1 20	4 5 2 24	7 0 0 0	4 18 2 8	4 14 1 4
Mulga	11 3 2 8	14 5 2 24	7 3 3 4	10 0 0 0	3 14 1 4	4 11 1 20	4 3 3 11	5 5 0 0	7 10 0 0
Sunrise	15 11 0 16	13 11 1 20	4 19 0 0	10 11 1 20	4 8 1 8	4 17 0 16	8 5 2 24	5 17 3 12	5 17 3 12
Barley—									
Trabut	8 14 1 20	15 0 0 0	10 18 1 8	7 14 1 4	3 18 1 8	3 2 3 12	3 14 1 4	5 13 1 8	6 19 1 4
Cape	9 1 3 24	11 4 1 4	9 1 3 24	8 2 3 12	4 0 0 0	3 0 0 0	3 2 3 12	4 16 1 20	6 4 1 4

* Harvested different dates.

for seed of this rapid-growing oat. As illustrating the difference between the varieties on the oats section, it is interesting to note that the popular Algerian variety was not fit to harvest on this plot until 26th September, being sixty-four days later than Mulga. Other varieties of oats came to maturity in between the harvesting of these two varieties. Sunrise came next to Mulga, and was cut on 12th August. Guyra (cut 21st August) yielded well, and the fodder proved very palatable to the stock. There is no doubt that Mulga, Sunrise, and Guyra are all worth growing, as they are early and capable of producing excellent green fodder, suitable for dairy cattle. Fulghum oats, here and elsewhere, exhibited signs of rust, and has been left out of the 1925 South Coast winter green fodder experiment. All other varieties of oats proved highly rust-resistant.

The wheat green fodder was found not so palatable for the stock, and did not keep its succulence so long in the paddock as the oats. It is, however, useful on soils that are too light for oat growing.

In the barley section the excellence of Trabut must again be noted. This variety has seldom been beaten by Cape since it has been under tests when sown under equal conditions. The trouble has always been to have it harvested when it matured. Owing to it being two to three weeks earlier in maturity than Cape, in many cases it was found to be on the dry side if left until the Cape variety was mature as a green fodder.

Further Trials with Wheats from South Australia.

The six King's Early crossbreds from South Australia were again tested (see this *Gazette*, April, 1924, page 254) during the past season, tests being made of their grain and also of their hay-producing capacity in comparison with King's White (one of the bearded parents) and Gresley, these being considered the most useful hay varieties at this farm, taking earliness of maturity into consideration. Following are the yields per acre:—

Variety.	Hay Yield.		Grain Yield.	
	tons	cwt.	bus.	lb.
Sultan	3	5	32	6
Felix	2	15	31	47
President	2	5	29	37
Rajah	2	7	28	52
Emperor...	2	8	28	0
Maharajah	2	15	27	42
King's White	3	0	29	23
Gresley	3	0	33	33

From the two years' results it would appear that Sultan is the best yielder of the six crossbreds, both of hay and grain. It is not quite as early as King's White or Gresley. Felix is the earliest of the crossbreds, and it is proposed to conduct further tests with these two varieties and to discard the remaining four.—H. C. Stening, Manager, Temora Experiment Farm.

Diseases of Sheep.

INTERNAL PARASITES.

H. G. BELSCHNER, B.V.Sc., Government Veterinary Surgeon.

Stomach Worm (Haemonchus contortus).

THE stomach round worm (*Haemonchus contortus*) is the commonest and probably the most destructive of the worms infesting sheep in this State. It is a thin, thread-like worm, ½ inch to 1½ inches long. The female is the larger and shows a red and white striping of the body, due to the coiling of the ovarian tubes round the intestine, which, when filled with blood, in the fresh specimen is of a bright red colour.

Stomach worms occur almost all over the State, except in the very dry areas. The infestation in sheep is more noticeable on the coast and tablelands, in which districts the heaviest loss is sustained. They are most severe on young lambs and are generally most numerous in early autumn, although they may be found in numbers right through the winter and spring.

The worm is found in the fourth stomach (abomasum), and in cases of bad infestation in the third stomach also. It may occur in other parts of the digestive tract, but only rarely.

In order to see the worm the fourth stomach should be slit open and held so that the liquid contents cannot escape, then by keeping the fluid still for a few moments the worms will be seen wriggling about. The worms are more easily seen if the contents of the stomach be placed in a bucket of clean water.

Life History.

The female deposits thousands of microscopic eggs, which do not hatch in the stomach but pass out of the body in the feces. Under favourable conditions of warmth and moisture, the eggs may hatch in a few hours, but sometimes not for a number of days or even weeks, depending on climatic conditions. The embryo which leaves the egg undergoes further development and becomes an ensheathed infective larva. In this condition it is very resistant to dryness and cold. When the grass is wet with rain or dew these larvæ crawl up the blades and are swallowed by the sheep as they graze. The larva continues its development in the stomach of the sheep and becomes mature in two or three weeks.

Effect and Symptoms.

The worms are nourished by blood sucked from the mucous membranes of the walls of the stomach and they cause much irritation. An anæmic condition is produced in the animal, exhibited by paleness of the visible mucous membranes and of the skin. The sheep becomes dull and falls away in condition. Diarrhœa may be present and there is often a depraved

appetite, the sheep eating dirt and other foreign material. In many cases there is a soft dropsical swelling between the jaws known as "bottle," and the animals are often "pot bellied."

The above symptoms are similar to those produced by other internal parasites. A positive diagnosis can only be made by killing an affected animal and examining the fourth stomach.

Death generally results from poverty and exhaustion, but it is not uncommon for animals in good condition to succumb to the effects of the parasite. The carcase of a sheep seriously infested with stomach worms is liable to be emaciated, and to show more or less anæmic condition of all the internal organs, with dropsical effusions in the serous cavities and into the connective tissues of dependent parts.

Treatment.

If taken in time the trouble is easily dealt with. The treatment consists of drenching the sheep with either a copper sulphate or an arsenical drench, preferably the former.

To prepare the copper sulphate drench, dissolve 4 oz. of powdered copper sulphate (bluestone) in a pint of warm water, using an enamel or earthenware dish. When thoroughly dissolved, add 4 oz. of mustard. Then add cold water to make up to 3 gallons, using an enamel bucket or earthenware jar, thus making approximately a 1 per cent. solution. This will be enough for 100 adult sheep, allowing for waste. The dose is 4 oz. of the mixture for adult sheep, 3 oz. for one-year-old sheep, and 2 oz. for lambs.

To prepare the arsenical drench, boil 1 oz. of arsenic and 2 oz. of carbonate of soda in a quart of water until dissolved (this will take some time). Pour off the clear liquid, bury any sediment which may remain, and make up the liquid to 3 gallons with cold water. The dose of this drench for grown sheep is 2 oz., for a 9-month sheep 1½ oz., and for a 6-month lamb 1 oz. This gives a dose of 2 grains of arsenic to a grown sheep, with a decrease for young sheep according to age.

It is advisable to bring the sheep into the yards the night before, and to drench after a preliminary fast. No water should be allowed for two hours afterwards. The sheep should be drenched in the standing position, with the head held horizontally or slightly raised. The head must not be forced far back or the drench given hurriedly, or choking may result. Drenching should be repeated in about fourteen days time, and again if necessary one month later if the best results are to be obtained. Care in giving the dose is very important, and a graduated measure should be used.

In addition to drenching, a suitable salt lick should be available in covered troughs in the paddock at all times. The one recommended by the Stock Department is as follows:—

Sulphate of iron	1 part.
Sterilised bone meal or calcium phosphate... ...	5 parts.
Liverpool salt	30 parts.

Prevention.

All parasites thrive in an animal that is low in condition. Therefore good management and the provision of nourishing food is the first means of prevention.

A glance at the life history of the parasite shows that the parasites are taken in by the sheep in an embryonic form when feeding, and that a fairly warm and moist condition of climate is most favourable to their development and increase. This is practically demonstrated by their increased prevalence following a wet summer. Also, the embryo will not live for an indefinite time awaiting the arrival of a host, so that the spelling of a paddock aids in getting rid of the parasite. The paddock should, however, be spelled for a year, as it is known definitely that the parasite can live for at least nine months in the ensheathed larval stage.

Change of pasture is recommended for the sheep, particularly from low-lying paddocks to higher country. Lambs are more liable to parasitic infestation than mature sheep, and special care should be taken with them by putting them in a paddock that has been spelled, if possible.

The draining or fencing off of swampy lands, the occasional burning off of pastures, and the subdivision of large paddocks, also the watering of sheep from troughs rather than from tanks or dams, are further recommended where practicable. When spelling a paddock, horses can safely be grazed there, but not cattle, as the latter may become infested with stomach worms and a number of other worms common to ruminants, and so re-contaminate the pastures.

Two Queries as to Dipping.

The following questions as to dipping were addressed to the Department last January:

1. Would it be advisable to dip sheep lightly infested with lice, and carrying six months' wool?
2. Would the fact of dipping sheep carrying six months' fleece adversely affect the quality of the wool or be dangerous to the animals?

If sheep showed any sign of lice, the correspondent was informed in reply, it was advisable to dip, though a certain amount of risk would naturally occur when the animals were carrying six months' wool. There were two courses open—either to dip carefully, thereby saving the wool and probably losing no sheep, or not to dip, thereby losing a large proportion of the wool and some sheep. When dipping sheep carrying a good growth of wool it was necessary to exercise great care that they did not scald or catch cold.

The dipping of sheep when carrying six months' wool would not adversely affect the growth of the wool, but unless great care was taken to mix the dip thoroughly and to keep it reasonably clean, there was a risk of a stain appearing in the wool. If the dip was made too strong there was a chance that at a later stage a break or tenderness would appear in the wool.—F. B. Hinton, Sheep and Wool Expert.

Poisoning of Stock by Solanum sturtianum.

H. R SEDDON, D.V.Sc., and H. R. CARNE, B.V.Sc., Veterinary Research Station, Glenfield.

FOR some considerable time the plant *Solanum sturtianum** has been suspected of being possessed of poisonous properties. Maiden (*Agricultural Gazette*, New South Wales, vol. 8, 1897, p. 16) says that a form of this species sent him from Thargomindah (Queensland) was said to have poisoned cattle. The same author (*Extract Proc. Therap. Soc.*, London, 1906) again refers to it as a poisonous plant. No investigation of its toxic properties, however, seems to have been made.

In an account of some feeding experiments with *Solanum esuriale*, Henry (*Agricultural Gazette*, New South Wales, vol. 23, 1922, p. 341), records the fact that whilst tests of this plant, including the berries, were negative, reports from Broken Hill district had thrown it under grave suspicion. In view of the fact that it is now found that *S. sturtianum* occurs also in that locality, and has now been proved to be toxic under similar circumstances to the cases referred to (reported by Stock Inspector Johnston), it would appear probable that the mortalities in question had been due to *S. sturtianum* and not to *S. esuriale*, and that some confusion had occurred in the selection of plants forwarded for identification. The particular plant used by Henry for the feeding tests referred to, it should be noted, was obtained in a different district (Nyngan), and was identified by the Director, Botanic Gardens.

* The following botanical description of *S. sturtianum* has been kindly furnished by the Director, Botanic Gardens (Dr. G. P. Darnell-Smith), who has also included a note on the differences between this and *S. esuriale* :—

SOLANUM STURTIANUM. F. MUELL.

An erect shrub with the close stellate tometum and rare prickles of *S. esuriale*, but apparently of taller stature. Leaves petiolate oblong or lanceolate, obtuse, entire or scarcely sinuate, ¾ in to 1½ in. long. Peduncles usually rather longer than in *S. esuriale*, bearing a sho t raceme of rather large flowers, the pedicels very short at the time of flowering, but lengthening afterwards. Calyx about 2 lines long when in flower, with short acute teeth, much enlarged and irregularly lobed when in fruit. Corolla ¾ in. to 1 in. in diameter, with short lobes. Anthers tapering upwards. Berry black, above ½ in. in diameter.

North Australia.—Glenelg district, North-west Coast (Marten).

South Australia.—In the interior (Sturt); Flinders Range and Cooper's Creek (Howitt's Expedition); Mount Searl (Warburton); Lake Gillies (Burkitt).

The species differs from *S. esuriale* chiefly in the large, slightly lobed corolla."

(Bentham in "Flora Australiensis," vol. iv., pp. 454–5.)

In addition to the localities mentioned by Bentham, we have specimens in the National Herbarium, Sydney, from Broken Hill, where it seems to be fairly abundant.

The berries, or fruits, are black, globose, varying from ½ in. to ¾ in. in diameter. Those of *S. esuriale* are yellow, and are more or less oblong or egg-shaped when fully matured.

Before giving the results of our work, therefore, an account of these mortalities may be given :—

(1.) In 1913 3,000 sheep were travelled to Broken Hill and then trucked to South Australia. No deaths occurred at Broken Hill, but on arrival at Terrowie ten were found dead in the trucks, and after unloading 1,000 died. Inspector Johnston notes, "These sheep travelled through the hills, which are literally smothered with *Solanum.*" Post-mortem examination showed "berries, a little smaller than the size of a threepenny piece, with seeds something like tomato seeds in the paunch."

(2.) In 1914 Inspector Johnston reported the loss of fifteen out of 100 bullocks. These cattle had traversed *Solanum* country on the 28th and 29th December en route to the saleyards and were sold on 29th. They were removed from the yards on 30th December in two mobs, each to a different destination. No *Solanum* was growing on the roads traversed by stock on 30th, and neither lots of cattle had water from the night of 28th until the afternoon of 30th. Cattle were not seen again until morning of 1st January, when they were seen to be sick, and several had succumbed in both lots, though they had been placed in paddocks at least 12 miles apart. "It appears that after drinking the trouble is hastened, as no ill effects were noticed until after these cattle had had a good drink."

(3.) In 1918 a mob of twenty-five bulls had travelled up the road through *Solanum* country. A few days later one started to foam at the mouth, scour, and lie down continuously. Subsequently the whole herd showed similar symptoms and four died. This mortality occurred at Corona Well, where presumably the animals were watered.

In a personal communication we are advised by Inspector Johnston that the plant grows only within a radius of 15 to 20 miles of Broken Hill, and that cattle depastured continuously on that country are not affected. Mortalities occur, however, amongst stock fresh to the country and especially amongst travelling stock.

Experimental Work.

In response to our request Inspector Johnston of Broken Hill forwarded a quantity of fruits of *S. sturtianum* for investigation of their toxic properties, and with these the following experiments were undertaken, a sample first being submitted to the Government Botanist in order that the identification might be confirmed. The berries were fully ripe.

With this material sheep and cattle were fed, and the following results were arrived at :—

1. The eating of the berries by stock leads to a fatal hæmorrhagic inflammation of the stomach and intestines.
2. As the berries were not eaten readily by the experimental stock, it became necessary either to pulp them and administer them

with water as a drench, or to add them to ordinary feed (chaff). In the latter case water was withheld until the feed had been consumed.

The animals used were starved, fed, or drenched, and then induced to drink a considerable amount of water, thus being subjected to much the same conditions as travelling stock would be likely to encounter.

3. The partaking of a large quantity of water after the berries is no doubt responsible for the rapid passage to the intestine of a large quantity of the poisonous principle of the berries, thus allowing of its rapid absorption.
4. Symptoms of illness are not manifested for a day or more after taking the berries, and the first noticed is that the animal becomes markedly depressed. Soon violent diarrhœa ensues, and this leads to marked weakness and wasting. Death usually occurs in from two to three days, though animals may linger longer. Other symptoms noticed were frothing at the mouth and slow breathing.
5. On post-mortem examination the most marked changes are seen in the fourth stomach and intestines. In these the lining membrane is dark red, and may be soft and tarry-looking. Blood and mucus are mixed with the bowel contents.
6. The following quantities of berries were found to be fatal:—Sheep, 1 lb.; cattle (two years old), 3 lb. It is probable that these do not represent the smallest quantities that might be fatal.

General Considerations.

Since the above work was undertaken, one of us (H.R.S.) has had an opportunity of visiting Broken Hill and seeing the circumstances under which stock are likely to get at this plant. At that time (September, 1924) there was little feed within miles of the town, and in order to reach the railway trucking yards stock would have to pass through a belt of *Solanum* country. This belt is anything up to 16 miles across, almost encircles Broken Hill, and reaches quite close to the town. In the absence of other feed, therefore, it is not surprising that cattle would greedily consume both the berries and leaves of the shrub, and as it is a rather scantily-leaved plant the quantity of berries they would get would be considerable.

Summary.

Mortalities amongst travelling stock in the Broken Hill district have been attributed to the eating of the berries of *S. sturtianum*. Experimental tests of the berries have shown that they are toxic for cattle and sheep, inducing a fatal hæmorrhagic gastro-enteritis.

(A full account of the investigational work appears in Science Bulletin, No. 24, Veterinary Research Report, No. 1, of the Glenfield Veterinary Research Station.)

Farmers' Experiment Plots.

MAIZE EXPERIMENTS, 1923–24.

Lower North Coast District.

J. M. PITT, H.D.A., Senior Agricultural Instructor.

THERE was a very keen demand for maize plots during the season, the following farmers co-operating with the Department :—

J. J. Webster, Macleay River.	H. Mate, Paterson River.
J. Twohill, Macleay River.	W. Crew, Paterson River.
J. B. Scobie, Macleay River.	J. H. Wells, Paterson River.
G. C. Lindsay, Hastings River.	B. W. Dark, Paterson River.
E. L. Andrews, Manning River.	W. Bogan, Allyn River.
R. McRae, Barrington River.	W. Logan, Hunter River.
S. P. Priestley, Paterson River.	J. K. Ward, Nambucca River.
J. Campbell, Upper Manning.	

Of the foregoing, all the plots were devoted to variety trials for grain, except Mr. Scobie's (which comprised an early variety trial for fodder), Mr. McRae's (a manurial trial for grain), and Mr. Bogan's, on which both variety and manurial trials for grain were conducted.

In addition, the following were supplied with seed for pure seed plots :—Messrs. McLeod and Weller, Manning River (fodder trials) ; J. Lambert, Manning River (early varieties) ; J. Campbell, H. Higgins, W. Logan, J. P. Mooney, A. W. Hooke, W Holden, G. Levick, B. Richardson, A. Abbott, R. Andrews, A. Norris and R. Richardson, all of the Manning ; L. Wheeldon, J. Booth and J. Ward, of the Macleay ; R. McRae (Barrington), J. Gillespie, W. G. Boydell, Doyle and Stubbins, S. E. Wheedon and A. C. Somerville (Paterson District).

Unfortunately yields were not obtainable at all centres. The early variety plots, chiefly in the Gresford district, were abandoned as far as yields were concerned, and used for cow fodder, a result of the very dry and droughty spring conditions. In other parts, on the Nambucca, Macleay. Hastings and the Hunter, especially where the plots were sown later and ran into better conditions, some excellent yields were obtained. In a couple of instances farmers " sold out " during the course of the experiment and reliable results were not secured

The Season.

Extremely droughty conditions prevailed over the whole of the district during the late winter, spring and early summer months, the Upper Manning and Gresford districts suffering to a far greater extent than other parts, chiefly owing to their more hilly nature. Even in the more favoured parts (as far as rainfall was concerned) only the well prepared and early ploughed areas weathered the trying conditions. A final break up of the drought, in

December, and the good rainfall over the remainder of the growing season, were responsible for some excellent yields on late plots and those that had not gone beyond the "reviving stage." The season was remarkable for the unusual succession of northerly and westerly winds throughout the dry period.

The rainfall was as follows :—

——	Bowraville.	Kempsey.	Taree.	Vacy.	Oakhampton.
1923.	Points.	Points.	Points.	Points.	Points.
September	......	230	172	......	......
October	.... .	167	148	......	......
November	......	41	223	82	135
December	......	599	472	415	454
1924.					
January	482	504	743	773	400
February	375	219	338	224	250
March	538	185	113	115	168
April	301	500	411	582	479

The Plots.

Although plots were established sometime ago at Burrapine on Taylor's Arm, this was the first occasion on which trials had been conducted on the Bowraville end of the Nambucca River. This district is regarded as one of the "safest" on the North Coast, and the advancement made in dairying and agriculture generally during the last ten years has been remarkable. Bordering along the river is much alluvial soil, mostly sown to maize and other cow fodder. The establishment of plots with Mr. F. K. Ward, one of the most progressive farmers on the river, should be of considerable benefit to the district. Varieties such as Manning Silvermine and Golden Superb are the most widely cultivated, and both do well. In the flats, Large Red Hogan, Manning Silvermine, and Yellow Hogan yielded best of the main crop varieties, but the farmer was most impressed with the yield of Craig Mitchell, a very early white variety. A good early variety is wanted for the river, so that after the grain crop is harvested, the land can be sown to winter fodder. Trials are being continued.

At Huntingdon some of the best land on the Hastings is to be found. Plots were established here for the first time. Mr. G. C. Lindsey, a keen agriculturalist, turned out a very fine plot. Large Red Hogan, Hawkesbury Hogan, and Manning Silvermine were the best, with others close up.

The plots at Vacy (Mr. Priestley's) and Oakhampton (Mr. Logan's) were established in connection with the branches of the Agricultural Bureau in those centres, and the results should be of considerable interest to the local farmers. The Hunter, although one of the oldest agricultural districts, is rather backward in maize growing, and although maize is not a crop that is largely grown there, the trials, if continued, should help to make known and popularise some of the better varieties. Pride of Hawkesbury topped

in both plots, Yellow Horsetooth and Large Red Hogan at Vacy, and Large Red Hogan, Ulmarra Whitecap, Fitzroy, and Hawkesbury Hogan at Oakhampton, also yielded well. At Wingham, Manning Silvermine, Large Red Hogan and Golden Beauty yielded best, while at West Kempsey and Mt. George a comparatively new variety, Funk's Ninety-day, created a very favourable impression although the crop at Mt. George, like many others, was too patchy for accurate yields. Funk's Ninety-day hails from Queensland, and should be an acquisition to the early varieties in these districts.

RESULTS of Variety Trials.

—	F. K. Ward, Bowraville. (sown 10th Oct.).	J. J. Webster, West Kempsey. (sown 18th Sept.)	G. C. Lindsay, Huntingdon. (sown 23rd Oct.).	J. Campbell, Wingham. (sown 21st Nov.).	S. Priestley, Vacy. (sown 15th Nov.).	W. Logan, Oakhampton. (sown 16th Nov.).
		bus.	bus.	bus.	bus.	bus.
Early Varieties—						
Craig Mitchell...	121	....	....	86½	....	....
Funk's Ninety-day.	....	106	....	....	....	....
Funk's Yellow Dent.	100½	79	105½	....	....	....
Wellingrove ...	61	80	89	71	....	....
Golden Superb	73½	88	100	86½	....	....
Hickory King. .	....	....	....	....	104	72½
Leaming	107	....	....	....	....	90
Eureka	....	66	....	....	....	....
Golden Glow ...	....	....	....	....	....	....
Early Red Hogan.	....	....	....	....	....	....
Golden Superb (Farmers' variety).	68½	83	....	....	....	....
Main Varieties—						
Fitzroy	107	94	111	90	103	110
Manning Silvermine.	122	....	120	....	105½	100
Manning Silvermine (Farmer's variety)	114	....	....	110	....	....
Golden Beauty	105	88½	112½	94	100	109
Yellow Hogan	113	104½	....	....	104	108
Hawkesbury Hogan.	....	64	123	73½	120	120
Ulmarra White-cap.	....	81	....	90	108½	120
Large Red Hogan.	127	81	128	99½	113	122
Large Yellow Horsetooth.	....	72	113	....	125	....
Golden Nugget	97	....	....	....	94	....
Pride of Hawkesbury.	....	....	....	87½	134	131
Manning Pride	....	....	110	....	....	....
Narrow Red Hogan.	....	....	....	....	....	120
Golden Drop ...	....	70	....	....	....	....
Farmer's variety	....	....	....	....	104½	....

In a fertiliser trial at Barrington, the best results were obtained from a dressing of P7 mixture. All the fertiliser plots yielded in advance of the no manure plots.

An outstanding feature of the season's trials has been the keen demand for pure seed of many of the heaviest yielding and early varieties. Since the inauguration of the maize yielding competitions, on both the Macleay and Manning Rivers, farmers have become more interested in obtaining pure seed of the leading varieties; furthermore, they are keen on keeping these varieties pure.

RESULTS of Fertiliser Trial at Barrington.

Fertiliser per acre.	Yield. bus.	lb.
No manure	82	17
Superphosphate, 182 lb. ...	85	22½
*M1, 238 lb	88	26
*M2, 224 lb.	93	41
*P7, 168 lb.	112	49½

* M1 mixture consists of thirteen parts of superphosphate and four of sulphate of ammonia; M2 of thirteen parts superphosphate and three of sulphate of potash; P7 of equal parts superphosphate and bonedust.

This was a good plot and the fertiliser portions showed up to advantage throughout the whole growth. Manuring is little tried in this neighbourhood, and it certainly is to be recommended even on these rich loamy alluvial flats. The plot was sown on 9th November, 1923.

Mr. Scobie's early varieties sown early for green fodder trials, were too uneven to weigh. The crops of Messrs. Andrews, Mate, Crew, Wells, Dark and others, were mostly used for cow fodder, failing to produce grain even enough for weighing; many of the varieties in the plots failed altogether. Messrs. McLeod and Wellers' plot, sown for fodder, was not weighed wing to there being a plentiful supply of feed. Yields were taken for grain as follows:—Leaming, 72 bushels; Boone County White, 70 bushels; Funk's Yellow Dent, 69 bushels; Golden Superb, 53 bushels; Golden Glow and Hickory King, each 51 bushels.

THE BUREAU CONFERENCE AT PARKES.

FARMERS are reminded that the fifth annual conference of Bureau branches in the Western District takes place on 31st March and 1st and 2nd April at Parkes. As the flourishing centre of an important wheat and sheep district, Parkes has special claims to a visit from those interested in these branches of farming, and this year's gathering promises to be no less attractive than its forerunners. Concession fare warrants are obtainable on application to the convening secretary, Mr. W. W. Watson, "Woodbine," Tichborne.

The Cherry in New South Wales.

A Discussion of Some of the Problems.

[Concluded from page 134.]

W H. BROWN, Editor of Publications.

One other aspect of the planting of a cherry orchard may properly engage attention before we turn to matters more connected with the management of the block during the periods of growth and of cropping.

Cross Pollination.

In the early history of commercial cherry growing, the fact that a variety might possibly require cross-pollination from some other variety to help it to set a profitable crop probably received little consideration. With a few exceptions plantings, being almost wholly for household use, were on a small scale, several varieties being planted, and provision thus being unconsciously made for the fertilisation of the blossoms of any self-sterile or partially self-sterile varieties. As plantings increased, however, and large blocks for commercial purposes became more common, the number of varieties was reduced to a few that cropped really well, and the fact that certain varieties set better crops when near to others that flowered at the same time began to appear to-day; it is a factor that must be taken into account in making dispositions for new orchards or additional blocks.

The problem is necessarily a complex one, and the more so owing to the variety of soil and climatic conditions under which the crop is grown; but certain lines are defining themselves. Among early varieties, for instance, it would seem that Early Lyons, though often planted in large blocks with apparent success, generally sets better crops where it is grown in proximity to another variety flowering at the same time. This is particularly evident in the Young district, where the setting is heavier, more consistent, and more uniform if Early Purple Guigne is near at hand. In one orchard this season the decline of the crop in a block of Early Lyons as the distance from a block of "E.P.G." increased was most apparent. It must be admitted that light settings in large blocks of Early Lyons are not invariable. The fine crop carried by a large bed of this variety in the orchard of Mr. A. Cunich is a case in point, but the facts are sufficiently consistent to suggest that intending growers will do well not to plant more than two or three rows of this variety in a block.

St. Margaret is another that frequently exhibits a disposition not to self-fertilise its blossoms. By some growers, in fact, it is regarded as an erratic cropper, but the possibilities are that it merely requiries some other variety that will cross-pollinate it. Florence, a variety of very similar habit as to blossoming (and in itself apparently little dependent on other varieties for fertilisation), is highly suitable for planting alternately with St. Margaret. In one orchard at Young the setting of St. Margaret near to Early Lyons

was light, but it distinctly improved as rows of Florence were approached and the grower is working over a few scattered trees among his St. Margarets to Florence. At Orange, Mr. D. D. Atkins, orchard inspector, remarked that Napoleon also served St. Margarets excellently in effecting cross-pollination, adding that "it is worth growing for that alone, even if the Napoleon crop is not marketed."

The logic of facts proved too much for one grower. He scouted the idea that cross-pollination was of much account, and at first averred that his St. Margarets were cropping best in the middle of the block, but a few minutes later when walking through the trees he was constrained to admit that "I do believe they are a bit better here"—"here" being close to Napoleons. Since that date this grower has become satisfied that those St. Margaret's carried the better crop which were near the Napoleons, and we hear now that he has announced his intention of planting Napoleons (for cross pollination purposes) through a block of St. Margaret's that was planted out last winter. Practical converts like this the Department would be glad to meet every day, and in more spheres than cherry growing.

The Care of the Young Orchard.

The maintenance of healthy growth in the young orchard demands continual attention. The soil must be kept in good tilth, weeds must be controlled, and the tree itself must be shaped on right lines by the careful use of the pruning knife.

The regular cultivation of the soil with a view to conserving moisture and assisting the processes by which plant food is made available is thoroughly essential. For the most part its importance is recognised, though here and there one might be tempted to remark that the bearing trees are well cared for, while young ones are in a measure allowed to look after themselves. Neglect of either old or young, however, is rarely found among successful growers, for they have long since learned that healthy vigorous trees are only obtained by good soil conditions, and similarly that consistent crops of quality, size, and flavour are ensured in the same way.

As the trees increase in size the fertility of the soil must receive attention. Reference has already been made to the fact that attention must be paid, especially on light soils, to the maintenance of a proper supply of humus, which, after all, is the basis of fertility. A harsh, unkindly physical condition was to be found in the soils of several orchards in the Young district, and whatever may be the method adopted it is becoming essential in these cases that something be done. Fully cognisant that the rainfall is light, Mr. Thornell advises the planting and ploughing in of Skinless barley every other year. If this were adopted for a few years and then continued perhaps less frequently, soil fertility would be increased meantime and sufficiently maintained later on. Black tares may also be used in the same way with advantage. One orchard was found where, though the trees are ten years old, wild oats still furnish a sufficient growth to make a good cover crop annually—a circumstance that wheat growers will best appreciate.

The excellent method of collecting bush mould and spreading it between the trees is adopted by a few growers—unfortunately by very few—and one or two apply sheep manure, procuring it from Homebush or other selling yards and spreading it between the trees, but well away from the butts. Needless to say, nothing in the way of soil exhaustion or of harshness in physical condition is likely to be experienced while such practices are continued.

Fertilisers are used by a few growers, and while it is true that some of the heavy soils on which cherries are grown are of simply inexhaustible fertility, there are many places where applications could be made with success. Mr. Neil, located at Uralla on lightish soil, in about alternate years applies a mixture of superphosphate, sulphate of potash, and sulphate of ammonia, spreading it by hand between the trees and then ploughing it in. Mr. Thornell advises for the lighter soils in the Young district a mixture of about 4 lb. blood and bone and 1 lb. sulphate of ammonia per tree per annum.

To Prune or not to Prune.

The shaping of the tree by pruning and thinning is another factor of importance in making an orchard and in maintaining it in profit. The lines upon which the young tree should be handled have already been indicated, the general idea being that for the first few years attention must be directed to getting a good framework, after which the knife should be seldom used if at all.

In fact, the cherry tree has generally been regarded as requiring no pruning once it is in bearing, but the doctrine requires to be accepted with reservations. There are some men of experience who consider that practically all varieties should receive a certain amount of attention at regular intervals, and there are one or two varieties as to which it is almost unanimously agreed that they require some pruning most years if not all.

Mr. Thornell expressed himself as believing that "pruning every second year would benefit all varieties after full growth and bearing have been reached," and there are growers who agree with him, one at Orange advocating letting the tree alone for a few years after it has been well formed, and then pruning regularly after it begins to crop. With the cherry tree the formation of the fruit buds does not generally require to be encouraged by pruning, as with other classes of fruit trees, but a certain amount of training and thinning out seems desirable in most varieties. Some attempt should be made to keep the crop within reach of the ground where possible, though, of course, in the case of the big Mazzard trees ample room for growth and for the elaboration of the plant sap is essential and encourages early cropping.

As to the necessity for pruning Early Lyons, practically all growers appear to be agreed. The tree is of spreading habit, tending to run out to fine extremities that droop heavily with the weight of the crop. The effect of cutting back these fine terminals is to throw the crop into the body of the tree where it is carried with greater safety and tends to be of better quality. Some growers carry out their pruning by removing the slender tips after the crop is off, but others prefer to do the work as a winter operation. Men who also grow other classes of summer and autumn fruit are not likely to

be able to spare much time for summer training and thinning, and the work has to wait for the winter. It is necessary to see that cutting back is to wood that will carry sap, or the leader will die back for a few inches, and gumming will ensue.

Eagle's Seedling, a variety of increasing popularity in the Young district, requires to be pruned with a view to maintaining a number of small leaders. If the leaders are too few in number they become very long, and the tendency is for the crop to set only on the tops, whereas with a larger number of smaller leaders the crop is set all the way up. and is consequently heavier, safer, and more easily handled.

Florence also repays a certain amount of attention in this respect. If pruned from time to time the fruit buds are better developed and the setting of fruit is also better.

In one orchard at Young an example was furnished of "how not to do it." An Early Rivers was found that had been pruned in the winter with the result that the crop matured at least three weeks later than it should have done. Had the fruit been marketed when ripe it would have met the competition of better varieties, and would have been practically worthless. Alongside was another tree of the same variety. which, not having been pruned, had matured a crop that, though lighter than the other, ripened at the right time, and had been already profitably marketed.

An interesting application of the fire smudge as a preventive of frost injury in the spring was found in the Orange district. Mr. Howarth, at Clergate, makes a practice of collecting all rubbish and placing it in heaps along the southern side of the orchard about 20 yards from the nearest trees. When frost threatens the heaps are fired about 4 a.m. with the aid of discarded motor oil, the fire being made as smoky as possible by throwing on soil if necessary. The rubbish is collected from all sources, and often has to be brought in from the bush. If, owing to a mild spring, it is not necessary to fire the rubbish, it is carted away before summer. The practice involves labour, of course, but the programme is gone through each year and is regarded as profitable.

Marketing the Cherry Crop.

As with all other fruits, the marketing of the crop is half the business. The truth of the statement was, perhaps, never more apparent than in the past season, when successive rains just as heavy crops of fruit were ripening off occasioned losses that must have totalled hundreds—even thousands—of pounds for the growers. The fruit split in immense quantities in all districts, and in consequence many heavily-laden trees were not even picked. How long it was allowed to hang it is impossible to say, but let it be said here that the practice of leaving fruit on the trees in such circumstances is a most pernicious one. The fungi that attack the decaying fruit are enabled to establish themselves in the wood of the trees and the dangers of extensive trouble from brown rot and similar diseases in subsequent years are enormously increased. The only safe course in such circumstances as confronted many

growers at Young and Orange last November and December, is to pick the trees clean and destroy the fruit. Even picking it on to the ground and ploughing it in at once is preferable to leaving it hanging.

A great deal of fruit in the past season was only slightly split and could be marketed for a small return, while the fact that the weather that followed the rain was for the most part fairly cool saved a substantial proportion from splitting at all. The effect of the rain, however, was to bring a great quantity of fruit forward rapidly, and growers had to get it off the trees and market it quickly for what it would bring. The result was a great quantity of fruit was placed on the market in an ungraded condition, the cases containing both prime sound fruit and split depreciating stuff mixed together. Whether the financial results justified the method, let the growers now consider. For the mixed lots it was common at Young to hear during November of prices like 2s., 2s. 6d., and 3s. per 12 lb. case being realised in Sydney. More careful men, adopting the precaution of grading the fruit, were at the same time getting 7s. and 8s. per case. In one or two cases 1s. per case was actually paid to boys and girls to pick out split and otherwise damaged specimens, in order to ensure a better price and preserve the grower's reputation. When the cost of the extra cases and the amount of the freight is allowed for, the men who thus graded made more money, and they also have their reputations for sound packing unimpaired in view of next season.

Uniformity in size, colour, and condition cost time and money to ensure, but they are factors in the selling price. Rarely has good grading been more emphatically vindicated by the commercial results than in the past cherry season.

Picking and Packing.

The picking and packing of cherries received some mention in an article in this *Gazette* in December, 1924. The picking-can there described and illustrated is extensively used in the southern districts, and the practice usually is to carry the fruit to the shed in these cans and to tip it (more or less carefully) on to the bench where it is packed.

A few growers with large areas have well-appointed sheds for the purpose. One of the best seen was that of Mr. Matthew Jasprizza at Young. The fruit is tipped from the picking-cans on to a sloping bench that is divided into several bins, the bottoms of which consist of slats set three-eighths of an inch apart, so that rubbish and small fruit may fall through. Experience suggests that the spaces between the slats should be a bit wider. The bins are 26 inches long from back to front and wide enough to contain two or three cases of fruit at a time. The bench does not require a very pronounced slope, and there are sheds where it is almost flat, but the sides require to be made about 8 inches high at the back and to fall towards the front, where the side and front boards are about 4 inches high. Between the front board of the bin and the packer, and below the level of the floor of the bin, is a narrow bench on which rests the 12 lb. case into which the fruit is packed. Working with the case tilted in front of him and the cherries in bulk in the bin beyond, the packer first "faces up" his case, "bunching them in" or

"rowing them in," as the case may be (though the latter is much the better method with high-grade stuff), and then lifts the front board of the bin, and draws forward sufficient fruit to fill the case, finally lowering the front board again before putting the next case in position. In this way the filling up of the case is done from the same bulk as the "facing," and an honest pack is secured. Some growers, in fact, in order to ensure an honest pack, always fill the box from the same picking-can as it was "faced" from, the can used holding about a box of cherries.

From the packer the case is handed over to a man whose duty it is to "dump" it lightly and then nail down the lid. In the vast majority of sheds this "lid" is really the bottom of the case, the fruit having been "faced up" on the true lid, so that when the top boards are removed in the retail shop the contents are seen in a neat and ordered condition. One Young grower, finding that the cherries are so shaken in travelling and handling that the faced-up side has lost some of its finish when it reaches the market, has conceived the idea of facing up on the true bottom of the case. The cases then travel with the "faced" side down, and when the retailer opens them by removing the bottom, he finds the fruit is more evenly "rowed" and the case apparently more uniformly filled, and therefore the more attractive.

The actual cost of picking, forwarding, and marketing cherries is much discussed. Prominent Young growers in conversation put it at 2s. 9d. per case, but at Orange Mr. S. Hawke considered that figure too high, even though it is his method to pick by daily wage and to go over the trees several times if necessary to get evenness in size and colour.

The capacity of the Sydney market for the absorption of fruit of moderately good to choice quality is literally enormous, and large quantities are also distributed from that centre to all parts of the State. Uralla growers find Brisbane market a good one, especially just before Christmas. The halcyon days, recalled by Mr. T. Hawke, when the first commercial cherry growers in the Orange district received 47s. 6d. for a 20-lb. case, have gone for ever, no doubt, but the 4s. to 8s. per case obtained for many tons of good to choice fruit is profitable enough in an average season. The loss over consignments that only bring 2s. per case is heavy indeed, and the only consolation is that with good grading and packing the grower "might have done better."

Some Disease Troubles.

Of all the troubles to which the cherry tree is heir (and there are a few), the most serious and most universal is that commonly known as "gumming." In reality it is a condition caused by an unhealthy state in the tree itself, which expresses itself in the collection of a gummy substance in defined areas. Usually these accumulations of gum force their way through the bark and collect on the surface, producing the characteristic "gumming," but sometimes the pockets exist under the bark and can only be detected on the surface by a slight swelling. The large affected areas just above the fork on the main branches are the most familiar expression of the condition, but quite young branches and twigs may also be affected.

Something about "Gumming."

The cause of gumming has probably been the subject of as much investigation as any problem in plant pathology, but the conditions under which it occurs are so varied as to make it a highly complex issue. Moreover, gumming may have become very advanced within the tree before the familiar symptoms are visible. The prime causes appear to be the growth of the tree under unhealthy conditions (such as heavy, poorly drained soils) and excessive supplies of water (whether as the result of too heavy falls of rain after drought or of injudicious irrigation). It would appear, therefore, that the selection of high, well-drained land, and the maintenance, as far as possible, of a uniform supply of plant moisture to the tree are factors of importance in its control. How often growers have observed an outbreak of "gumming" when a very wet spell has followed a prolonged period of dry weather could not, perhaps, be told; but at least the facts strongly indicate the importance of methods of soil management that will conserve moisture during dry months. This not only keeps the tree in healthy vigour through the drought, but ensures that it is not affected in the same degree when later on heavy rain overcharges the soil with moisture.

The treatment of affected trees with a view to their recovery also interests orchardists. The hard, inelastic condition of the bark during dry weather and the strangulation that ensues when, with better weather, the tree again begins to make growth and the underlying tissues begin to expand are well known, and have suggested a line of treatment now practised by many growers —that known as scoring, or scarfing, or slitting the bark from near the ground to well up the larger limbs. The relief thus given is often most marked. Mr. W. A. Birmingham, of the Biologist's Branch of the Department, and Mr. Thornell, together inspected one tree that had been so treated, and they found that the bark had expanded 2 and 3 inches in places, while it was estimated that the girth of the tree had increased by not less than 15 inches. The relief to the tree in such a case can only be beneficial, and, as a matter of fact, the improvement in almost all cases where the method is adopted is marked.

The scoring or scarfing must be done with the knife at right angles to the tree, or the wound will open out too much, and it is also essential that the cut be continuous. In one orchard it was observed after scoring that most of the trees looked much better, but isolated branches showed no marked improvement. An examination of these trees disclosed the fact that when the scoring was being done, the knife had missed a few inches here and there, with the result that the strangulation of those branches was not relieved. The knife must also be handled with care so that it shall not go too deep and cut into the wood.

The appearance of gumming on the surface may be anticipated by watching the trees for areas of bark which become discoloured a dark brown and which yield a little to pressure. The bark above and below such areas may be scored at once with advantage. Indeed, we came acrosss one grower at Uralla who makes it a practice to go round his orchard in the spring and to score all trees where such patches can be seen.

What a Grower Did.

The effect of gumming on some trees is most marked—a generally sickly, unthrifty appearance being common, and undoubtedly the dying off of isolated branches is in some cases attributable to it. Most interesting and suggestive work in this connection has been done by Mr. E. A. Neil at Uralla. Confronted by the loss of trees that had hardly more than commenced bearing, he started applying the old method of in-arching.

Where a branch was exhibiting the symptoms of dying back, he selected a suitable sucker at the root and worked it into the branch above the gummed area just as though grafting. In a short while a perfect union had been effected, and the branch, invigorated by the inflow of healthy sap direct from the root, picked up and within three or four months was manifestly more vigorous and healthy. Success in two or three cases so confirmed Mr. Neil in the method that he has saved quite a number of trees. In certain instances it was sufficient to make use of a shoot in the main trunk below the gummed area by turning it into the branch above the injury, and several trees are to be seen in the orchard that are quite a network of these "bridgings." The present appearance of the trees and the fact that they continue to crop is quite sufficient justification for all the work involved.

That this improvement is permanent, or likely to be so, is proved by the fact that some of the shoots and suckers so treated in this orchard are now as thick as a man's wrist—proof that they have been growing thus for some years.

In one case a tree had suffered severe injury by a cultivating implement, and the whole side of the tree looked so poor that it was necessary to do something. There were no suitable suckers below the tree, so a healthy one was selected from elsewhere and planted under the tree. When it was apparent that it had taken root it was cut back and grafted (or in-arched) into the tree. The result has been a marked recovery. Probably not less than a score of trees have been treated by Mr. Neil in this way, and not in a single case with disappointing results.

The method is not a new one, of course, in-arching having been practised in older lands for many years, but its marked success in the hands of this grower encourages us to direct the attention of others to it as a means of preserving fruit-bearing trees that for one reason or another appear in part to be unthrifty.

"Sour Sap."

Reference has already been made to "sour sap," and its probable relation to the dying back of certain trees and portions of trees. It is a condition that is sometimes attended with gumming as one of its effects, but it has other distinctive characteristics, and gumming is by no means invariably present, and growers should be careful not to confuse the two things.

Sour sap, which markedly interferes with leafing in the spring, is most erratic in its occurrence, attacking one tree and not its neighbour, perhaps only one branch in a tree, or even half of a tree and not the rest. Similarly recovery is also erratic, one tree recovering and another alongside showing no improvement whatever, and perhaps finally dying out altogether.

As with gumming, it seems to be attributable to unfavourable soil conditions (such as poor drainage) and to a period of scarcity of moisture followed by a period of superabundance. As slitting of the bark on the same lines as with gumming is almost invariably attended by some improvement, it would appear that tightness of the bark and strangulation of expanding plant tissue below when it should have ample room to develop have something to do with it.

Scoring or scarfing of the bark with a keen knife can be recommended.

A Few Insect Pests.

Of insect pests the cherry has its share. The most serious, perhaps, is San Jose scale, but it can be controlled by spraying with miscible oils or lime-sulphur in the winter. Mr. Neil, at Uralla, however, observed that when the scale was killed off trees began to gum that had never gummed before. Evidently the killing of the scale had been followed by such an accession of vigour on the part of the tree that the bark did not allow of expansion to take place fast enough. Nowadays this grower regards scoring or scarfing for gumming as an essential concomitant to spraying for scale.

An illustration of the serious effects an uncontrolled attack by an insect may have on trees is afforded by an Orange orchard. The grower was spraying with arsenate of lead for cherry slug some four years ago, and had actually treated part of one block, but was unable to finish when, first rain and subsequently other circumstances, prevented the completion of the work. The untreated trees, this grower says, suffered so severely that they have not yet wholly recovered, while the adjoining trees (treated at the right time) have borne profitable crops yearly since. Such a case only serves to emphasise the necessity for the treatment of trees at the proper time. Any insect will increase at an amazing rate if left alone for a few weeks at certain stages and under favourable conditions.

Black cherry aphis gave some trouble in the past season, attacking the tips of young luscious growth at a time when the orchardist was fully occupied with other things. Under such circumstances it is simply a case of making choice of the most immediate necessity—the harvesting of the crop or the control of the pest—the one in view of the present and the other of the future. Fortunately the commonplace method of looking after the bird in the hand and trusting to luck as to the one in the bush (in other words, harvesting the ripening crop and letting next year's take care of itself) is generally justified by the results, and one can only hope that the luck won't change.

Some Leading Varieties.

The task of obtaining a systematic account of the varieties grown in the State would be monumental, but a few facts collected about some of the best known may be of interest.

The earliest variety of any commercial importance is Early Purple Guigne. It is followed by Burgdorf's Seedling and Early Lyons. Early Rivers also has had admirers, but they are not many to-day. Burgdorf's Seedling

carries its fruit in close clusters under dense bunches of leaves, which provide an unusual amount of protection from hail and heavy rain. It is somewhat impartial in the matter of stock, doing well on either Kentish or Mazzard, providing the pecularities of the stocks themselves are regarded. Early Lyons is now the general favorite for the early crop on account of the size and quality of the fruit, and the weight of the crop. The greatest disadvantage attaching to it is the ease with which it splits if rain falls when it is nearly ripe.

Following these may be mentioned Eagle Seedling, a variety that is gaining favour in the Young district, particularly on account of the excellent quality and flavour of its fruit. It is perhaps a trifle later than Early Lyons, is of very erect habit, and, properly handled, it distributes a heavy crop along long leaders that nevertheless are easily handled. The tree is of vigorous habit, so vigorous in fact that for the first season or two the fruit tends to split rather readily, but it improves in this respect as it matures.

Werder's Early Black packs and sells well, but the fruit is a bit small and not equal in flavour to Early Lyons and Eagle Seedling, and the trees are apt not to withstand drought so well.

Bedford's Prolific is a heavy cropper and profitable to the orchardist, though, we were assured, not so good for the consumer as an attractive appearance might suggest.

As main season and late season varieties, Florence and St. Margaret are outstanding. Both are consistent, heavy croppers, both yield fruit of good firm quality that carries well, and both are ready to market at the height of the summer and of the holiday season, meeeting, thus, a good market. In colour they are complementary one to the other, Florence being light and St. Margaret dark, so that they meet the public eye in a harmonious contrast when properly graded, packed, and displayed.

The peculiarities of these two varieties in respect of pollination and of pruning have already been mentioned. Florence is rather the handier tree to pick, carrying its fruit more accessibly, but it exhibits a disposition to shed a larger proportion of small fruit and to shed them later than do most other varieties. It is generally regarded as one of the worst of varieties in regard to gumming. St. Margaret requires consideration in regard to pollination, as already explained.

Noble is a useful variety with which to close the season. It comes in a bit later than St. Margaret, but is very like that variety, and therefore usually meets a good sale, though some growers regard it as rather soft and therefore not too good as a carrier.

A number of other varieties are favoured by various growers, though mostly in small blocks, the larger plantings generally being one or more of the foregoing.

Black Republican, rather resembling St. Margaret, but ripening a bit later, and Napoleon of about the same season, but easily marked and bruised in handling are the most extensively grown of the rest, though, indeed, "the rest" are somewhat numerous.

Cultivation of the Orchard.

W. MILLIGAN, Manager, Soldier's Settlement, Kentucky.

CLEAN cultivation during the growing season is the recognised practice in all orchard districts in Australia. Notwithstanding this statement, and judging by the appearance of some orchards the beneficial results are not yet fully realised. To get the best results the cultivation must be carried out thoroughly and at the right time. During the spring, and again during late summer, in average years the weather conditions are such as to quickly dry out the moisture from the soil. These periods are vital to the growth of the trees. During spring from the bud-bursting stage until the fruits have set is the tenderest time of the tree's life; while about January a second growing season is usually experienced, and later, in the case of apples, pears and citrus, the conservation of soil moisture is at times necessary to the proper maturing of the fruits.

The benefits of a loose soil mulch from three to four inches deep in regard to the conservation of soil moisture during very dry periods is widely recognised under Australian conditions. Constant cultivation preserves this loose soil mulch during dry periods. As a general rule it is best to cultivate the orchard while there is plenty of moisture in the soil. The idea is to cultivate after every good shower. Allow the land time to absorb the rain thoroughly and then cultivate as soon as the surface is firm enough to carry, and before the moisture has time to escape.

In addition to conserving the soil moisture and making it available to the trees throughout the growing period, good cultivation also destroys weed growth and warms and aerates the soil, thus setting up conditions most favourable to the beneficial soil bacteria. Well directed cultivation maintains the soil in a condition favourable to root growth, improves both the mechanical and physical condition of the soil, makes available plant food, and helps to keep many of the fruit pests in check. Too frequent cultivation must be avoided, however, as it may cause a rapid loss of humus, the effect of which will be a poorer physical condition of the soil.

In many of our orchard districts there is a sufficient growth of weeds between the months of March and August during average years to keep up a natural supply of organic matter in the soil. In other districts, however, the problem is more difficult, the growth of weeds being insufficient to supply vegetable matter to the soil, while the growing of green crops to be ploughed in must be done with caution, as the cover crop may make too great demands on the limited supply of moisture in the soil, and the crop will suffer from lack of moisture.

Hillside Orchards.

Hillside orchards require a carefully thought-out system of cultivation. Where the slope of the land is steep there is always danger of washing

during sudden heavy rain storms. The practice of ploughing across the face of the hill acts beneficially when the rain is steady, but is risky owing to the surface water collecting in one place and then breaking over, causing a scouring of the surface soil. The first consideration should be to avoid all surface water from grass lands, hillsides, and cultivation, from entering the orchard. If considered necessary a wide shallow surface drain say 3 to 4 feet wide and not deeper than 3 to 4 inches at the centre with gradually sloping

Jonathan Apple, six years old.

The tree is carrying a good crop of fruit which is just distinguishable. Note the clean cultivation.

sides should be run towards the lowest level and grassed over. Avoid deep drains with sharply cut sides owing to the liability of deep erosions. Provided the surface of the land is kept level, shallow furrows can be put in after any fine cultivation during the spring and early summer.

Ploughing during the period of heavy rains could be arranged so that each land will only carry the water falling on its own area. The plan is to arrange the work so that the furrows will not have to carry the water for any distance.

Ploughing.

The foundation for a good soil mulch is a deep ploughing carried out while the soil is in good condition after the winter rains. The land should be allowed to stand until it has had time to drain thoroughly and is still moist. The months of July and August are usually the time when this operation is best carried out in the cooler districts, i.e., as soon as the winter pruning and spraying are completed. In the warmer districts the ploughing should be completed at the end of July. By ploughing early the weeds are turned under whilst soft and sappy, and when there is sufficient moisture in the soil to ensure rapid decay and the subsequent breaking down of the organic matter to form humus. Weeds are also turned under more easily at this stage of their growth.

Six-year old Apple Trees.

Note the strong uniform growth and clean cultivation.

The width of the cut should be regulated so that each sod will rest lightly and evenly on the other and allow of all weeds and surface rubbish being turned under and completely buried. In finishing off, the headlands should be left neatly ploughed to at least fifteen feet from the last row of trees. The headland on which the horses were turned during the ploughing should be treated by striking out in the centre and completed to a sufficient width to give a neat finish to the work. To keep the orchard in good tilth a certain amount of hand labour with the hoe will be necessary. This can be minimised greatly by ploughing up as close as possible without causing injury to the trees either by striking the trunks or tearing out the lateral branches. To avoid serious injury to the lateral roots the plough should be raised sufficiently when ploughing near to the trees.

After Cultivation.

The implements generally used to maintain the soil mulch are the tine-harrow, springtooth cultivator, and disc cultivator.

Where the land is moist and friable the tine-harrow does efficient work and does it quicker. The springtooth cultivator stirs the soil without inverting it, and is the best to use when the soil becomes very dry and is certainly without compare on light soils. It stirs and brings about a division of the soil with a proportion of coarse and fine particles allowing the finer particles to lie underneath.

The disc cultivator is splendid for keeping excessive weed growth in check. Where the weed growths are coming away quickly it is equal to the plough for destroying the weeds if started early and it does the work quicker. On very light sandy soils the disc cultivator keeps the soil in a very fine state of subdivision and is liable to destroy the mechanical condition of the soil by too constant use.

Cultivation can be, and is occasionally overdone. Beyond retaining a loose soil mulch during the summer season and the destroying of the weed growths, cultivation is unnecessary and a waste of time and labour. Working land with any kind of harrow or cultivator while wet has the effect of setting it down, which destroys the condition of the soil. Harrowing land constantly, when dry, especially light soils, divides the particles very fine, and the first soaking rains will harden the surface and make another ploughing necessary.

Return of Infectious Diseases Reported in January.

The following is the return of outbreaks of the more important infectious diseases reported during the month of January, 1925:—

Anthrax	4
Contagious pneumonia of swine	Nil.
Pleuro-pneumonia contagiosa	3
Piroplasmosis (tick fever)	Nil.
Swine fever	,,

—Max Henry, Chief Veterinary Surgeon.

Seed of Toowoomba Canary Grass (*Phalaris bulbosa*).

Farmers who have been waiting to obtain seed of the above grass will be pleased to know that large quantities should be available this autumn. Seedsmen in Sydney and in New England are all stocking seed, and it is anticipated that considerable areas will be planted this season. It is undoubtedly the best winter grass for coastal and tableland districts, and for many parts of the north-western, central-western and south-western slopes. Growers are advised to sow 4 lb per acre on cultivated land in the autumn or early winter months.

"Leaf Scorch" of Strawberry.

W. A. BIRMINGHAM, Assistant Biologist.

THIS disease, specimens of which were recently received from La Perouse, presents itself as purplish spots up to a quarter of an inch in diameter on the upper surface of the leaves (Fig. 1).

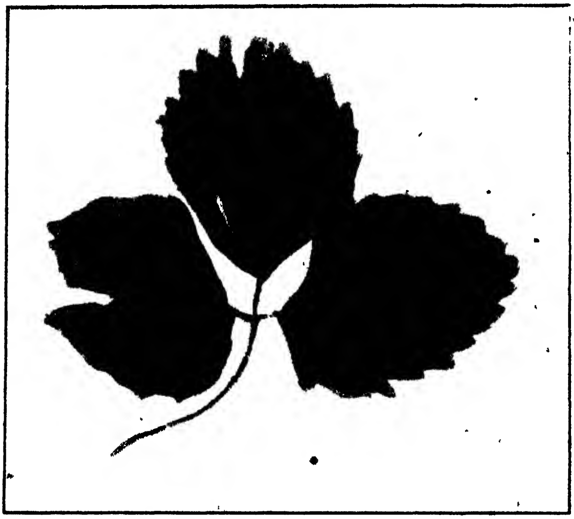


Fig. 1—Strawberry Leaf Scorch.

The edges of the spots are not clearly defined as they are in the case of the common leaf-spot of strawberry (*Mycosphaerella fragariae*), neither is there the conspicuous light centre present in the material from La Perouse. Leaf-scorch spots may run together and involve the whole of the leaf.

On the under surface of the leaves the disease does not stand out sharply, but appears as purple or brown areas.

It is in the early part of the season that the purple spots appear—later in the year the leaves have a scorched, brown appearance. The fungus also attacks the leaf and flower stalks. The disease has been recorded from the United States and Canada, in the latter country as being sometimes serious before the crop is picked.

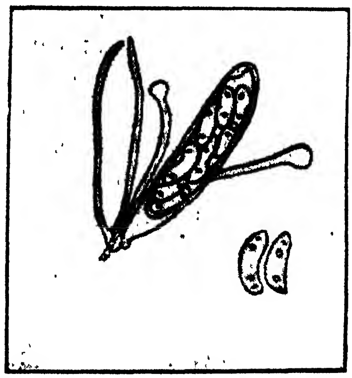


Fig. 2—*Mollisia earliana.* Sacs (asci) with spores inside, sterile filaments, and free spores mature (ascigenous stage).
—*after Stone.*

Causal Organism.

The fungus responsible is *Mollisia earliana* (E. & E.) the conidial stage of which is *Marsonia potentillae* (Desm.) Fisch. (Fig. 3). The former (mature) stage develops late in the season after

the conidial form and carries the disease over till the following season (Fig. 2). The fungus also winters in leaves which remain green, developing the conidial stage in spring.

Stone[1], who carried out a series of inoculation experiments, has shown that the fungus *Mollisia earliana* is responsible for leaf scorch and that *Marsonia potentillae* is its conidial stage.

Fig. 3—*Marsonia potentillae* Camera lucida drawing of conidial stage—section of pustule showing spores.

Control.

No experiments have been carried out for the control of the disease, but it is reasonable to expect that the disease can be considerably controlled in the following manner:—

1. Avoid susceptible varieties as far as possible.
2. Do not use plants showing any blotch conditions when planting out.
3. As far as it is practicable, destroy all diseased material by burning it.
4. Early spraying with Bordeaux mixture, made up in the proportion of 1 lb. of bluestone; 1 lb. of *freshly*-slaked lime to 20 gallons of water (for preparation see Spray Leaflet No. 1).

It is essential that a spray nozzle should be used which will direct the mixture on to the underside of the leaves as well as on the upper surface.

[1]. Stone R. E., Phytopathology, Vol. 12, 1922, p. 375.

We need to inform the farmers as to the best methods of producing honey, but we need as fully to inform the general public on the fact that honey, like milk, is one of the best foods, one of the rare products of nature which do not need manipulation to be assimilable by the stomach.—*American Bee Journal.*

Apiary Notes.

W. A. GOODACRE, Senior Apicultural Instructor.

WHILE there have been some very good crops of honey extracted this season, the peculiar conditions of weather prevented the record harvest of which the flora gave promise.

There was a plentiful supply of rain to allow the best results in nectar secretion, but the rainfall in most cases was followed by a cool change, and in some of our best honey-producing centres fairly heavy frosts were experienced right up to the end of December. The bees were rather put out by these changes in the weather, and at times required tactful handling. During the settled weather the apiarist could extract in the open in many places without causing any excitement among the bees, and it was hardly necessary to use a veil for protection. It was different, however, immediately after the cool change, the bees being inclined to resist any hive manipulation, and robbing would be easily induced during the extracting work.

Motor Transport.

At the Government Apiary, in our out-apiary work it was considered best this season to bring all of the honey to the home apiary for extraction. We used a small motor lorry for the work, and we could get a lorry load of supers off the hives before the bees became too troublesome, and when we returned for another lorry load, the bees had settled down sufficiently to allow a full load to be obtained without much inconvenience.

One apiary is two miles distance from the home apiary, and the other four miles away; we could bring in a load in seven minutes from the two-miles apiary, and twenty minutes for the four-mile one, the road not being so good. We did not damage one comb in the transit, although they were very heavy with honey. Thus the delay of shifting material for extracting was saved, and much inconvenience during the work. It was much more convenient to treat the comb and honey at the home apiary where we have an elevated platform, a honey heater, and ample tank accomodation.

The motor lorry at this apiary has been in use for about nine years; it still pulls very well, and costs very little more than the upkeep of a horse and vehicle. Quick transport is a big item in removal of bees, as well as a time-saver in all other work, while it is always a risky business with a horse-drawn vehicle. It is safe work, too, removing bees by motor transport.

The Honey Market.

It is anticipated that there will not be an extreme glut in the honey market this year if a reasonable distribution of sales is made. If the Sydney market is made the dumping ground, then there will be trouble, and probably

low prices. By catering for the country and local trade, and by those who can afford to, holding their supplies until later on in the winter, we can hope to have fairly good market results.

Wintering of Bees.

For good wintering of bees, let us repeat these essential points:—(1) A good vigorous queen to obtain the necessary force of young bees. (2) Good brood combs in the brood nest. (3) A good hive which allows comfort for the bees during the cold weather. (4) A good quantity of good stores; for a fair-sized colony not less than one full ideal super, plus what is naturally contained in the brood nest.

In this mild climate there is not much done toward preparation for winter; nevertheless a little more trouble than is generally given should be taken, and the results would well repay the apiarist. Here is one point: At the close of the season remove those empty, or practically empty, supers, and allow the colonies to be compact. It is quite a usual practice among apiarists to leave all the supers on the hives during winter, and as generally there are a few empty ones, the same comfortable conditions are not obtained as where the colony is compact and the stores convenient.

"American Fruits."

THE full title of this work is necessary to an appreciation of the extensive way in which it covers its subject—"American Fruits: Their Propagation, Cultivation, Harvesting, and Distribution."

The fact that, compared with the production of other primary articles, fruit growing is of more recent origin, rather disposes it as an industry to readjustment, and certainly opinion upon many points is in a fluid condition. The appearance of a comprehensive work of nearly 900 pages, excellently printed on good paper, and liberally illustrated, is therefore a circumstance of interest.

Part I of the book, covering 393 pages, deals with the pome fruits, adopting the very proper method of discussing the apple in 369 pages, and then devoting a few pages each to the pear and quince. The same method is adopted in connection with other fruits, and needless repetition is thus avoided.

It is often suggested that fruit-growing to-day consists in the control of pests and diseases, but there is also a good deal to be said on the other side of things, and growers will appreciate the fact that practically the whole of this book is devoted to positive aspects of the subject, negative ones only being incidentally referred to.

The author, Mr. Samuel Fraser, has an obvious interest in the practical and commercial side of the business, and he has had the assistance of other valued American authorities.

Published by the Orange Judd Publishing Company, New York.

Pure Seed.

Growers Recommended by the Department.

The Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops, in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon, and (2) after a sample of the seed has been received by the Under Secretary and Director, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the prices for the seeds mentioned hereunder.

Wheat :—

Canberra	Manager, Wagga Experiment Farm, Bomen.
	Manager, Experiment Farm, Temora.
	Manager, Experiment Farm, Condobolin.
	Hobson Bros., Cunningar.
	J. W. Eade, Eade Vale, Euchareena.
	E. J. Allen, Gregra.
	W. W. Watson, "Woodbine," Tichbourne.
	E. J. Johnson, "Iona," Wongalia, via Parkes
Clarendon	E. J Johnson, "Iona," Wongalia, via Parkes.
Cleveland	Manager, Experiment Farm, Bathurst.
	W. Burns, Goougirwarrie," Carcoar.
Currawa	E. J. Allen, Gregra.
Federation	Manager, Wagga Experiment Farm, Bomen.
	Hobson Bros., Cunningar.
	Gollasch Bros , Pine Park, Milbrulong.
Firbank	Manager, Wagga Experiment Farm, Bomen.
	Manager. Experiment Farm. Condobolin
	J. W. Eade, Eade Vale, Euchareena.
Florence	Manager, Experiment Farm, Glen Innes.
	H. Harvey, "Rawsonville," via Dubbo
Gresley	Manager, Experiment Farm, Cowra.
	Manager, Experiment Farm, Condobolin.
	W. W. Watson, "Woodbine," Tichbourne.
Hard Federation	Manager, Wagga Experiment Farm, Bomen.
	Manager, Experiment Farm, Temora.
	Hobson Bros., Cunningar.
	J. W. Eade, Eade Vale, Euchareena.
Improved Steinwedel	E. J. Allen, Gregra.
	Hobson Bros., Cunningar.
Marshall's No. 3	Manager, Wagga Experiment Farm, Bomen.
	E. J. Allen, Gregra.
	Hobson Bros., Cunningar.
	Hannett Bros., Linden Valley, Cunningar
Onas	E J. Johnson, "Iona," Wongalia, via Parkes.
Riverina	Manager, Wagga Experiment Farm, Bomen.
Wandilla	Manager, Wagga Experiment Farm, Bomen.
	Manager, Experiment Farm, Temora.
	Hobson Bros., Cunningar.
	W. W. Watson, "Woodbine," Tichbourne.
Waratah	Manager, Wagga Experiment Farm, Bomen.
	Hobson Bros., Cunningar.
	Gollasch Bros., Pine Park, Milbrulong.
Yandilla King	Manager, Wagga Experiment Farm, Bomen.
	Manager, Experiment Farm, Temora.
	W. W. Watson, "Woodbine," Tichbourne
	H. Harvey, "Rawsonville, via Dubbo.
	Hannett Bros., Linden Valley, Cunningar.
Zealand	Manager, Wagga Experiment Farm, Bomen.

Oats :—

Algerian	Manager, Experiment Farm, Bathurst.
	Manager, Experiment Farm, Glen Innes.
	Manager, Experiment Farm, Temora.
	Gollasch Bros., Pine Park, Milbrulong.
	F. Rose, junr. "Rosemount," Cunningar.
	E. J. Allen, Gregra.
Guyra	Manager, Experiment Farm. Glen Innes.
Lachlan...	E. J. Allen, Gregra.
Mulga	E. J. Allen, Gregra.
	C. E. Prell, "Gundowringa," Crookwell.
	Manager Experiment Farm, Temora.
Myall	C. E Prell, "Gundowringa," Crookwell.
Sunrise	J. W. Eade, Eade Vale, Euchareena.
	C. E. Prell, "Gundowringa," Crookwell.
White Tartarian	Manager, Experiment Farm, Glen Innes.
Yarran	C. E. Prell, "Gundowringa," Crookwell.

Barley :—

Cape	Manager, Experiment Farm, Bathurst.
Mulga	Manager, Experiment Farm, Temora.

Grasses :—

Phalaris bulbosa	H. Simpson, Stonehenge Station, Stonehenge.
	Manager, Experiment Farm, Glen Innes.

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

MANURING FOR MEAT.

ATTENTION has lately been directed in several countries to the value of the top-dressing of pastures. In England basic slag, which is chiefly valued for the amount of phosphoric acid it contains, has been somewhat prominent for the purpose, and in view of the work lately done in this State in the way of top-dressing with superphosphate, the results of some trials conducted in Nottinghamshire over a period of five years are of interest.

A paddock was secured and divided into four parts, the parts being valued at 11s. 6d., 12s., 9s., and 7s. per acre respectively. To the first, no fertiliser is applied; to the second, 7¼ cwt. per acre of 38 per cent. basic slag has been applied each year; to the third, 7½ cwt. per acre of 60 per cent. mineral phosphates has been applied each year; and to the fourth, 13½ cwt. of 20 per cent. basic slag each year.

The paddocks were separately grazed and the increases in the live weights of the animals (cattle and sheep) carefully noted each year. The cumulative effects of the top-dressing have been most marked in the past two years, as the following little table shows :—

Fertiliser per acre.	Increase in live weight. 1923.		1924.	
	qr.	lb.	qr.	lb.
None	2	16	0	10
Basic slag, 38 per cent., 7¼ cwt.	7	26	6	1
Mineral phosphate, 60 per cent., 7½ cwt.	8	3	3	8
Basic slag, 20 per cent., 13½ cwt.	4	6	2	27

Poultry Notes.
MARCH.

JAMES HADLINGTON, Poultry Expert.

THE time of the year at which the fundamental factors in poultry-farming come into play is again upon us—it is during the coming two or three months that the foundation for next breeding season will be laid. The old adage that " what one sows so also will he reap " is as applicable to a crop of poultry as to any other. If, for instance, a lot of hens are kept that are over a paying age, or even hens that are played out with their first laying season, a low general average of production is in sight for the next twelve months. It follows then that this feature should receive immediate attention. The next question is the class of breeding stock to be penned for the forthcoming breeding season, and still another is the treatment of the pullets now laying or commencing to lay. Each of these factors has a vital relationship to success, and is worthy of separate discussion.

Hens Retained on the Farm.

The primary factors in connection with the welfare of pullets were dealt with in these notes for December last. We can, therefore, now take the hens at a time when the clearing up process should be nearly complete. On a well-regulated farm the disposal of aged and inferior hens will have been going on gradually during the last two, and in some cases, three months, but the great bulk of hens should still remain to be marketed. In this connection two faults are observed, both leading to loss. The one is the marketing of aged hens too early, and the other is marketing too late. Some poultry-farmers have been slow to learn, for instance, that many hens which are completing their second laying season will, if in good health, continue to lay equally well, and sometimes better, during December, January, and even February, than first-year hens. The reason is that the first-year hens have in some cases laid some months earlier than the hens in their second year. Hence it does not follow that all hens completing their second laying season should be marketed indiscriminately. This is only another instance of how success in poultry-farming depends upon good judgment and observation rather than mere adherence to a set of rules.

Only recently a correspondent on the subject of the disposal of hens at the end of their second year's laying gave the laying performances of a hen for seven consecutive laying seasons in rebuttal of the idea that the profitable life of a hen is only two laying seasons. The tallies were as follows :—

First year, 203; second year, 189; third year, 199; fourth year, 138; fifth year, 114; sixth year, 94; seventh year, 57.

In replying to this communication it was pointed out that the hen under notice was an exceptional one, and by no means representative of what might be expected from flocks. At the same time it was acknowledged that many aged hens were more profitable than some younger ones, but that

neither were representative of flock averages of their class. It was also pointed out that with hens that were proved good layers in their first and second year there were invariably about 30 per cent. that were worth keeping for a third-year laying. There are, however, other circumstances to be taken into account. A hen whose laying ability might justify keeping her in times of low feeding costs might not pay for keeping at a time when feeding costs are high. In this connection, too, it should be taken into consideration that the greater the age the higher the mortality. This is an important factor, since the death rate of physically good hens over 12 months old is usually about 8 per cent. Probably 12 and 16 per cent. respectively would represent the death rate of hens in their second and third year. It should also be borne in mind that the losses will be proportionately greater in physically inferior flocks. This is an important factor often lost sight of by the farmer.

Preparation for the Breeding Season.

What has been mentioned in connection with egg-laying ability and physique of the flock in relation to high or low mortality should bring to mind the importance attaching to the class of stock penned up for breeders. I have yet to find a physically strong flock of any recognised laying breed that was a non-paying flock under good management, but scores of flocks come under notice with which, notwithstanding that there is a fairly high average egg production, failure occurs from losses in hatching and rearing, coupled with a high mortality in adult stock. In such flocks, too, there is necessity for more rigid culling of first-year hens at this time of the year, which again reduces the effective laying stock on the farm. Thus, it is possible to have a high average egg production and a poor paying farm. There are three primary factors in the case, namely, good breeding stock, good rearing, and good egg production. The last is not possible as a permanent feature without proper regard for the two former. High egg production may for a time obtain with low grade stock, but in such cases the end is inevitable, and there are only too many poultry-farm wrecks attesting the truth of this. This being so, it follows that every effort should be made to keep a high standard of physique in the flocks, despite the advice often tendered by persons of limited experience who discount good stock and aver that birds of quality cannot lay well. Right now, when the breeding pens are about to be reassembled, is the time to visualise all these things.

In this connection, when purchasing breeding stock there is no necessity to pay fancy prices such as are often demanded for physically inferior birds bred from some noted layer. As an advertisement the abnormal hen might be most spectacular, but as a breeding unit she is often very disappointing. If an explanation on this point is needed it will be found in the fact that most of the progeny of abnormal birds throw back towards the average of the breed. Herein lies the reason why many poultry-farmers fail to improve the average laying of their flocks by the introduction of these abnormal specimens or their progeny. On the other hand quality of any kind cannot be obtained at low prices.

A poultry-farmer on the lookout for good stock should be prepared to pay a reasonable price for them, and when forming a nucleus of a strain the best is not too good. But by the best in this case is meant the best in visible quality as well as breeding. In this connection it is high time poultry-farmers realised that, no matter what the breeding of a bird, if it does not show quality in size, shape, form, and the points that go to make up all the breed stands for, it is useless to expect that it will transmit these qualities to its offspring. It should be realised that the only way to maintain good flocks is through constant selection of the best for breeding from, and that this work can only be efficiently performed by those who know their breed. Hence the necessity for a better knowledge under this heading.

Another feature that needs emphasis is that when flocks have degenerated very appreciably, as is sometimes the case from the practice of too close breeding or even poor rearing year after year—or, as a matter of fact, from any cause whatever—it is a mistake to expect that the introduction of new blood will save the situation at once. When constitutional vigour has been impaired for one generation after another, weakness becomes stabilised much in the same way as any other feature. In such cases the introduction of new blood on one side is not always productive of such radical improvement as might have been expected. Mending up degenerate flocks is a slow process. It is far better to make a new start with better stuff and breed up so as to replace the old as it becomes effete. The temptation to hang on to a strain of birds that is giving a good egg yield is well understood, but the time to attempt improvement is at the point where loss of size and vigour becomes apparent. One of the worst features one meets with is that even when degeneracy becomes recognised the farmer often hesitates to strike out and do something in the way of introducing new stock to retrieve his position for fear of a fall in his average production. While it appears to be a choice between two evils, the real evil is the danger of being put out of the business through the degeneracy of the home flock.

Breeding or Feeding—Which?

Viewing the question of high production from both angles with the different laying breeds in mind there is not the least doubt that feeding is quite as important as breeding. It is well known that the breed averages of good birds in, say, Leghorns, Langshans, Orpingtons, and Wyandottes range round 200 eggs per hen, but while this is so, unskilful feeding might in extreme cases result in less than half that number of eggs being laid. The truth of the matter is that while the breeding factor is being given credit for all the high production the feeding factor is of even more importance. This might be regarded as an extreme statement, but the fact is that a payable egg production is obtainable from average good birds of the breeds mentioned when they are skilfully fed and attended. On the other hand, no matter what the breeding, a satisfactory egg production will not be obtained from birds badly managed.

To many farmers feeding consists merely in throwing so much food to the birds without any sympathetic consideration for the welfare of the flock. These same farmers will obtain any kind of food said to induce better laying or will pay high prices for some supposed high-laying strain, but fail to realise how much is dependent upon their own efforts in the form of skilful feeding and general management of the birds. High production has been the aim of poultry-breeders during the last twenty years, and yet there are hundreds of farms which fail to produce a modest twelve dozen per hen per annum. After all this effort it is about time that poultry-farmers took closer stock of their position, especially in view of the fact that high laying capacity was known previous to the efforts mentioned. If it is maintained that egg production has been largely increased by breeding for high fecundity, then there is no escape from the conclusion that there is something lacking in our management of the breeds or the character and quality of the flocks in being. That some poultry-farmers are securing high average production is known, but they are skilled feeders and managers if not always skilled breeders.

Maize as Poultry Food.

Owing to the difference in price of wheat and maize at the present time many inquiries have been made recently as to the merits of the two cereals as poultry food, and to what extent maize can be fed. The same problem presented itself in January four years ago, and the following was published in these notes under the heading, "A Plea for Maize":—

"At the present time, by far the cheapest grain for poultry is maize. And, while it is not contended that this grain should be fed exclusively, it is contended that up to half maize could be fed for the evening grain feed to advantage. In addition to the economy side of the question, in the light of combined scientific knowledge and practical experience it is about time poultry-farmers scrapped this old-time prejudice against maize as a poultry food. The idea that a fair proportion of this grain fed to poultry is too heating, and that it will make them too fat, is unsound. True, if the evening feed of wheat is suddenly changed to one of maize the laying hens will most likely fall off in production, but the cause of that is the change of food, and not that the hens would not (if used to it) lay just as well on maize.

"As a matter of fact, if the writer—while holding that mixed grain is much preferable to either wheat or maize by themselves—was by circumstances forced to feed on one grain only, and had the choice between wheat and maize, he would prefer the latter. This contention is based upon experience and supported by observation.

"It is well known that the colour of the yolk of the eggs is largely influenced by the food, and that the yolk of maize-fed hens' eggs is very much higher in colour and richer than of those laid by wheat-fed hens."

No harm will come from feeding as much as half to two-thirds of maize at the evening feed.

Imports and Exports of Fruit.

The following table, compiled by the Government Statistician, shows the imports and exports of fruit—fresh, dried, and processed—during the quarter ended 31st December, 1924:—

Description.	Imports.	Exports.
Interstate.	Cases.	Cases.
Fresh Fruit ..	296,532	126,482
Tomatoes ...	65,058	...
	bush.	bush.
Melons ...	......	404
	lb.	lb.
Canned Fruit ..	20,840	140
Dried Fruit—		
Unspecified ...	26,012	532
Currants ..	7,672	196
Raisins ..	15,484	56
Apricots ..	1,736	...
Apples ...	2,940	...
Prunes ..	1,064	588
Pears	1,092	...
Sultanas ...	.....	...
Peaches ..	840	...

Description.	Country of Origin.	Imports.	Exports.
Oversea.			
Fresh Fruit –		Centals.	Centals.
Citrus	... .	1,015	16,659
Apples .	....	...	227
Pears ..	....	...	38
Pineapples ...	. .. .	...	1,254
Bananas ...	... .	1,806	...
Other... ..	....	48	2,584
Dried Fruit—			
Apples, Pears, Peaches, &c..	U.S.A.	lb. 20,7[illegible]7	lb. ...
Apples ...	....	...	814
Apricots ..	....	...	452
Currants	....	...	27,876
Prunes ...	U.S.A. . . .	92,086	784
	France .. .	575	...
Peaches ..	....	...	1,013
Raisins—			
Sultanas ..	Commonwealth.	73,192	97,424
	Spain	7,369	...
	U.S.A.	938	...
Lexias ..	....		18,453
Other .	Spain	39,595	602
	U.S.A.	9,017	..
Dates	Mesopotamia ...	3,522,892	74,776
Other ...	United Kingdon	600	3,229
	U.S.A.	79,268	...
	Spain	14,591	. .
	Italy . .	1,922	...
	China	6,107	...
	Asia Minor ..	26,450	...
	Mesopotamia ..	1,291	...
	Turkey	69,208	. .
	Sweden	150	...
	France ...	111	...
Preserved in liquid –			
Apricots .	. . ..	...	285,010
Peaches ...	. .	.	268,846
Pears ..	. .. . .	..	6,886
Pineapples ...	.. . .	. .	26,679
Other ...	. . ..	.	23,504
Raspberry Pulp	... ..	..	5,660

The Dipping of Lambs.

A correspondent asked lately whether, in the case of unshorn lambs, more or less seeded, it was better policy to shear at once, then dip, and shear again at the usual shearing time (September), or to dip at once without shearing.

The reply was that it would be wisest to shear them as soon as possible, then shear at the usual time and dip as usual. The greatest gain would be made in the subsequent development of the lambs, while very little depreciation would be noticed in the wool value on account of the double shearing.—F. B. Hinton, Sheep and Wool Expert.

Orchard Notes.

MARCH.

W. J. ALLEN and W. LE GAY BRERETON.

BY March as a rule the orchardist is expecting the commencement of the period of reduced evaporation and (in regions of ample rainfall) feels that he can slacken up in cultivation. It would not be surprising, however, if the present perverse summer lasted longer than usual, and in the inland districts, where the rainfall is often only just sufficient, and perhaps no water for irrigation, it is wise to still look after the conservation of soil moisture. Under such conditions it is necessary as soon as possible to put the soil in a condition in which it will catch and hold as much as possible of the rain that falls between now and next spring; consequently it is a good practice from now on in the districts referred to to plough each bed of varieties as soon as possible after harvesting is completed on them.

Insect Pests.

Many of the citrus scales will by March have become too advanced to be easily killed by sprays, but fumigation can still be continued with success. One of the advantages of fumigation over spraying is that the former will kill the scales at a more advanced stage than the latter, and hence can be delayed until the greatest proportion of young scale have hatched out or emerged.

The instructions given for control of codlin moth last month still hold good. The moth on the whole is not giving so much trouble this season as last, but growers should not on that account slacken their control measures, or they will find an increase of trouble next season. They should read again as a reminder Mr. Broadfoot's article on this subject, which appeared in these pages last October.

Soiling.

Citrus growers who have completed their campaign against scale insects will now find time to carry out soiling operations, provided the ground is not too wet for carting on.

Harvesting Apples and Pears.

The tableland and inland growers of apples and pears are approaching their busy time. Instructions were given in these notes last month regarding the care necessary in picking and handling these fruits, either for direct marketing, or for common or cold storage. A couple of points might be added—points which, although they seem almost too obvious to mention, are often neglected. Care should be taken not to allow grit to accumulate at the bottom of the picking boxes, as the skin of the fruit (its natural protection against the entry of decay germs) comes in contact with it and is

injured. It is difficult with cases that are open-jointed between the sides and bottom to avoid this grit trouble, but it is very often greatly aggravated by pickers pulling the cases towards them in the loose soil, instead of lifting them. Again, the carter should wear a bag or canvas apron; then, by raising one knee, he can wipe the bottom of the case across the upper part of his leg after lifting the case from the loose soil, and before stacking it on top of another case. The second point is not to allow the fruit, after picking, to be exposed to the sun. Stack the cases on the shady side of trees, and get them carted to the shade before the sun gets round on them. Where practicable, allow the fruit to be stored to cool down in the open, spacing the cases well apart in narrow stacks over night, and taking care not to let them become exposed to the heat of the sun before being placed in store next morning. Cooling off in this way will, to a great extent, prevent the heating up of the store by solar heat absorbed by the fruit. This applies to both common and cold storage, but is especially important in the former, as there is no artificial means of quickly reducing the temperature again.

Storage.

There has been an increase during the last few years in research work in the cold storage of fruits, and it would be wise to review some of the accumulated results to see whether there are indications that changes from present operations would be likely to lead to improvements. The investigations carried out by the British scientists who visited Australia during the 1923 season dealt, of course, more directly with storage on board ship, but they nevertheless conveyed an object-lesson in land storage. A striking feature is that through previous investigations at Cambridge Low Temperature Research Station, not all primarily pertaining to "brown heart," the scientists were able to draw deductions as to the probable cause of brown heart, and were able to make recommendations for the 1923 shipments, with the consequence that these were practically free from the trouble. Moreover, they were able to foresee the possibility of their expedition failing through brown heart not occurring, and to provide for such contingency by placing in each apple cargo on each ship on which the investigation was carried out a certain number of cases in such a manner that the ventilation given them could be controlled by the investigator independently of the general ventilation of the hold, and could thus produce the condition to be investigated. Thus in one visit they were able to establish the theory that brown heart was caused by the apple being kept in an atmosphere overloaded with carbon dioxide, which theory is now very generally accepted as being correct. This all points to the value of such scientific data, without which experiments could only be carried out blindly, with the probable loss of much time and fruit before a solution was stumbled upon.

It had previously been shown that a certain proportion of carbon dioxide in the atmosphere of the storage room is probably beneficial in retarding the ripening of the fruit. The 1923 investigations showed that the proportion of carbon dioxide should not rise over 10 per cent.

Scald.

Investigations in Victoria indicate that of varieties liable to scald immature fruit is the more susceptible; this is in agreement with the general opinion in this State and also with that expressed in American publications. Scald is believed to be caused by gases other than carbon dioxide given off by the apples, and both Victorian and American investigations have shown that it can be eliminated by thorough ventilation. Unfortunately, sufficiently thorough ventilation cannot be obtained in the commercial cold storage of fruits. American investigations have shown that the use of oiled wrappers will reduce scald to a large extent, and judging by various American publications the oiled wrapper is coming into wide use.

Reports received by the Department from New Zealand on some preliminary trials, and also on three oversea shipments with oiled wrappers, are not favourable. It is possible that the paper used was not up to standard—American experiments showed that it should contain 15 per cent. by weight of oil—or perhaps other conditions were so favourable to scald that it could not be controlled. However, on present evidence the oil wrapper on the whole offers the most promising solution to the scald trouble.

Jonathan Spot.

Investigations have shown fairly persistently that of apples liable to this trouble the over-mature rather than the immature are the more subject. This is rather an aggravating fact, as by avoiding "Jonathan Spot" one is, perhaps, approaching the scald line, though there is, perhaps, a stage which may also be the ideal for standing storage and coming out with the best appearance and general condition. In actual picking from the tree it is difficult to arrive at a very fine degree. Even if pressure-testing machines are perfected, the picker must rely on the outward signs, as all the fruit on a tree is not at the same degree of maturity at the same period, nor is even all the fruit in the same cluster, and often if some of the fruit from a cluster is gathered the rest in the cluster must be taken, or it will fall

Internal Breakdown.

The cause of this trouble appears more difficult of explanation or correction than the foregoing. Results in the last two seasons in Victoria are not altogether consistent, nor do they altogether agree with results of investigations carried out at Cawthron Institute, Nelson, New Zealand. It seems likely that fruit grown on rich, rather moist soil, is more liable to internal breakdown than that grown under dryer conditions; also there is more complaint of the trouble with fruit harvested during a wet autumn. Certain storage conditions do probably influence apples already predisposed to the disease, but investigations need to be carried further for definite conclusions. Victorian experiments support the American contention that slight water-core will disappear during storage at a cool, even temperature, not necessarily

ordinary cold storage temperature. Experience in a cool store in this State also supports the contention that cool storage will remedy slight water-core. The bitter-pit investigations carried on by the combined States some years ago showed that cool storage delayed the development of the disease. Most of the practices carried out in cool store have been arrived at by consensus of results in commercial storage. The working temperature is very universal here and in other countries, and though perhaps the investigation in some troubles seems to favour a higher temperature, there certainly is not sufficient to support a change.

There is some difference of opinion as to rapid or slow cooling down to the storage temperature. The English scientists' investigations certainly support rapid reduction for apples in sea transport, and English experiments show that under actual commercial storage it is not possible to cool too rapidly for the good of the keeping of the apple. A test where apples were reduced from 70 degrees to 34 degrees Fah. in twenty-four hours did not harm the fruit or affect its keeping qualities. One fact is quite apparent—that a great deal yet remains to be solved in respect to cool storage of fruits. Records and comparisons of various cool store experiences are useful, but are not sufficient, as often the history of the fruit before storing is not known, and the different conditions pertaining often render them incomparable. For instance, when it is found in a cool store that the first of a certain variety stored has scalded, but that some held in common store for a considerable period before storing did not scald, it may indicate that this variety is better for delayed storing, but on the other hand if those placed in store later in the season were of a later picking it may only be an indication that the less mature fruit of this variety is more liable to scald. It is necessary that any tests be carried out with a fair bulk of fruit, and be continuous over a number of years; consequently investigational work in storage is expensive, and its continuation would seem to be a matter calling for co-operation between the interested States, as in the case of the bitter-pit investigation.

"Practical Bacteriology."

As its sub-title indicates, this little book is "an introductory course for students of agriculture." It originated in a series of notes prepared for the use of students, and in a concise and convenient way it presents material that should be of value as an elementary text-book in laboratory methods. In 180 pages it describes general methods of bacteriological technique—preparation and sterilisation of apparatus and media, use of microscope, together with the staining and cultural reactions utilised in the examination of bacterial types. Special sections deal with the study of milk and dairy products, the bacteria of the soil, and with certain bacterial types which are responsible for the production of disease in plants and in animals.

Published by Oliver & Boyd, Edinburgh, from whom comes our copy.

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alterations of dates should be notified at once.

1925.

Society.	Secretary.	Date.
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Bathurst P. and A. Association ..	....	,, 22, 23, 24
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Upper Manning A. and H. Association (Wingham) ..	D. Stewart	,, 29, 30
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Clarence P. and A. Society (Grafton)	L. C. Lawson	,, 29 to May 2
Hawkesbury District A. Association (Windsor)	H. S. Johnston	,, 30 to May 2
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Agricultural Gazette of New South Wales.

Farmers' Experiment Plots.

WINTER FODDER TRIALS, 1924.

Lower North Coast.

J. M. PITT, H.D.A., Senior Agricultural Instructor.

EXPERIMENTS with winter fodders were conducted in the following places during the year 1924:-

L. Wheeldon, Austral Eden, Macleay River.
J. R. Scobie, Austral Eden, Macleay River.
J. T. Webster, Macleay River.
G. C. Lindsay, Hastings River.
A. S. Ussher, Kendall.
W. Thompson, Kendall.
C. Minnett, Lansdowne.
P. Standing, Lansdowne.
A. M. Hooke, Langley Vale.
A. Longworth, Lower Manning.
B. Allan, Oxley Island, Lower Manning.
B. Richardson, Dumaresque Island, Lower Manning.
J. P. Mooney, Dumaresque Island, Manning River.
H. Flett, Taree Estate, Manning River.
G. Levick, Taree Estate, Manning River.
R. Richardson, Mondrook, Manning River.
A. C. McLeod, Mondrook, Manning River.
J. Nixon, Nabiac, Wallamba River.
J. Campbell, Wingham, Upper Manning.
A. H. Norris, Mt. George, Upper Manning.
S. Ehherk, Paterson River.
M. Smith, Paterson River.
T. Pearse, Hunter River.
Alex. Smith, Bandon Grove, Williams River.

A much larger area than hitherto was sown to winter fodders. Usually the state of the pastures in the autumn may be taken as a guide to the area likely to be sown for the winter, but this season, although the pastures at that time were excellent, there was a pronounced increase in the acreage cropped. Whether it was the advent of cold nights early in the autumn, and the prospects of a long, cold winter, farmers were certainly taking extra precaution against another fodder shortage. As it happened, the winter was long and cold, but the spring following was one of the best experienced on the coast for many years.

A word or two may be interpolated on the subject of conserving fodder. Practically no attempt is made in this direction, other than to put a little lucerne hay away in some corner, although either pit or stack might easily be adopted as a means of conservation. More remarkable still is the utterly wasteful methods adopted by some farmers in disposing of their surplus of winter fodders. Cutting, burning, and other equally wasteful methods are to be deplored, especially when for an outlay of a few shillings per ton, inexpensive methods of conserving the material could be adopted. Droughts and dry periods will surely come again, and such waste as has been seen this year will, no doubt, be regretted. The action of Mr. Alex. Smith,

	G. Levick, Taree Estate.	J. P. Mooney, Dumaresque Island.	A. Longworth, Jones Island.		J. Nixon, Nabiac.	J. Campbell, Wingham.	M. Smith, Paterson.	C. Minnett, Lansdowne.	R. Standing, Lansdowne.	A. S. Ussher, Kendall.	W. Thompson, Kendall.	G. C. Lindsay, Huntingdon.	L. Wheeldon, Austral Eden.	J. R. Scoble, Austral Eden.	R. Allan, Oxley.	R. Richardson, Mondrook.	A. C. McLeod, Mondrook.	T. Pearse, Hinton.	A. H. Norris, Mount George.
Date of sowing	10th April.	10th April.	12th April.	26th April.	13th May.	14th April.	1st May.	29th May.	15th May.	Early May.	Mid-May.	15th July.	...	16th April.	1st May.	...	...	...	8th May.
	t. c.	t. c.	t. c.	t. c.	t. c.	t. c.	t. c.	t. c.	t. c.	t. c.	t. c.	t. c.	t. c.	t. c.	t. c.	t. c.	t. c.	t. c.	t. c.
Wheats—																			
Florence ...	...	11 1	...	...	...	...	10 11	4 12	...	12 0*	...	4 18	10 0	7 0	10 0	12 0	5 8	...	...
Cleveland ...	...	...	...	...	...	...	...	4 19	...	...	...	...	...	...	...	13 2	6 15	...	...
Currawa ...	...	...	...	...	...	13 1	10 0	...	...	...	...	...	10 10	...	8 10	12 17	6 8	...	...
Wandilla ...	...	...	...	...	...	12 12	...	...	...	...	8 0*	...	...	...	...	12 12	...	...	...
Warren ...	...	13 4	6 16	7 12	6 10	12 12	9 13	...	8 2	10 10*	...	5 0	9 10	10 0	...	...	5 0		...
Gresley ...	...	...	...	...	8 8	...	...	...	...	...	...	...	...	...	...	...	...		...
Clarendon ...	...	...	...	...	...	...	...	3 15‡	...	...	8 0*	...	...	...	...	...	...		...
Firbank ...	...	...	...	...	...	...	...	...	5 19	...	...	...	...	...	...	...	...		...
Barleys—																			
Skinless ...	8 18	†	...	...	...	...	...	...	...	...	...	...	...	...	7 0	...	...		...
Pryor ...	8 8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	6 2	No data to hand.	...
Trabut ...	12 5	†	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...		...
Cape ...	8 18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...		...
Oats—																			
Guyra ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...		12 4
Mulga ...	...	‖	5 0	4 10	...	14 16	11 3	...	...	10 10*	...	...	...	§	**	11 16	10 0		11 17
Mulga and vetches	...	...	...	...	...	...	...	...	13 7	...	...	...	...	...	...	14 18	...		...
Sunrise and peas ...	...	...	...	...	...	...	...	9 2	...	...	14 0*	...	...	...	10 0	...	10 1		14 12
Sunrise ...	...	13 5	5 0	4 6	12 10	14 2	12 3	6 11	9 7	...	...	4 19	11 0	§	††	15 0	9 5		14 8
Sunrise and vetches (Black)	...	...	5 10	4 16	15 1	...	...	...	...	...	14 0*	...	...	...	...	15 10	12 7		14 9
Sunrise and vetches (Golden)	...	...	...	...	16 0	...	...	...	...	...	...	...	...	...	...	...	...		...
Algerian ...	...	...	...	...	...	12 6	...	...	...	...	...	...	...	...	...	...	...		13 5
Algerian and vetches	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...		...
Algerian and peas	...	...	...	...	...	...	...	10 13	...	...	10 0*	...	...	...	...	...	...		13 11
Fulghum ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	‡	8 11‖	...	10 17**
Lachlan ...	...	...	...	...	...	...	...	...	8 2	...	...	...	...	...	...	12 0	...	...	...
Mulga and peas ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	10 14	...	...
Yarran ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	12 1

* Approximate. † Not weighed—poor. ‡ Failure. § Rusty. ‖ Rusted. ** Very rusty. †† Badly rusted.

Bandon Grove, in storing some 40 or 50 tons of oats, vetches, and lucerne in pits was one of the bright features. Although handicapped by a shortage of labour and other circumstances, his hurried venture is deserving of every success.

The Season.

Fairly good rainfalls occurred throughout the autumn and winter, and again in the late spring. It was the prevalence of some very cold snaps in August, September, and October that hindered the growth somewhat, and yields in consequence were not as heavy as in previous years. Some crops sown late ran into the good late October and November rains, and grew well, and it was some of these that were wantonly destroyed, as mentioned above.

Rust was present in many places, due, no doubt, to the cold spring weather. Mulga and Fulghum oats proved by far the most susceptible. Several crops of Sunrise were also affected. The majority of the wheat crops escaped. Mildew was present in some of the barley plots. In the majority of cases vetches did better than peas.

Cultural Notes.

Heavy rains of the previous summer and autumn hindered the preparation of seed-beds, and in many cases only rough plots were available. A hurried ploughing and a stroke or two with the harrow was more the rule than the exception. The "droopy" season would not allow of more careful attention in many cases, and also helped to keep yields low and plots uneven.

Varieties.

Sunrise oats, with and without legumes, were easily the best and most popular crops. Only in very few instances now is Algerian sown. Mulga, on account of its susceptibility to rust, did not do as well as last year. Fulghum was poor. Florence and Warren were the best wheats, and a good plot of Currawa was produced here and there. Cleveland, in one instance, was cut and turned into hay, and another farmer allowed the crop to mature for seed, and harvested some good "fowl-feed" grain. The barleys were patchy. Vetches gave heavier yields than field peas, where they were included in the plots.

Some remarkable figures were obtained from a fertiliser trial at Dungog. An application of 56 lb. superphosphate per ½ acre with the seed at sowing, and again partly as a top dressing, gave enormous increases over the unmanured plots. The difference in the colour of the cereal, too, in the mixed plots was another outstanding feature. This was the crop that Mr. Smith turned into silage.

Some good results were obtained in "new" areas, notably Nabiac, Huntingdon, and Kendall.

The following rainfalls may be taken as an indication of the fall throughout the district :—

1924.	Taree.	Kempsey.
	Points.	Points.
April	411	500
May...	104	181
June	280	270
July	496	655
August	184	179
September	233	164
October	139	231
November	732	597

Mr. Flett's plot was put in very roughly, and was eaten off by dairy cows.

Mr. Hooke's trial, with 1 cwt. and 2 cwt. superphosphate per acre, was superior to the no-manure plot, but no yields were kept.

Mr. Webster's plots were sown on poor, sour, second-class country, and in most cases the crop failed owing to the wet conditions.

Variety and Fertiliser Trial at Bandon Grove.

A fertiliser trial was conducted during the season in co-operation with Mr. Alex. Smith, Bandon Grove, Williams River, with the following results :—

Crop.	Fertiliser	Yield.		
		t.	c.	q.
Sunrise oats (at 2 bus. per acre)	None	16	3	2
Sunrise oats (at 2 bus.) and vetches (at ½ bus. per acre)	None	19	7	3
Sunrise oats and vetches ..	56 lb. superphosphate per ½ acre at sowing	21	11	1
Sunrise oats and vetches	28 lb. superphosphate per ½ acre at sowing and 28 lb. per ½ acre as top-dressing six weeks later	21	16	1
Sunrise oats and vetches	14 lb. superphosphate per ½ acre at sowing and 14 lb. per ½ acre as top-dressing six weeks later	18	5	3
Mulga oats (at 2 bus. per acre) .	....	19	19	1
Florence wheat (first cut, 30th July, 11 tons 1 cwt. 1 qr.; second cut, October, 4 tons 12 cwt. 1 qr.)	... .	15	13	2
Currawa	..	15	7	1

The value of superphosphate is most apparent in the yields. Apart from that, the class of fodder was much superior in the fertiliser plots. Mr. Smith states that he has been dairying long enough to know the value of the rich, luxuriant type of fodder compared to the yellowish type of the unfertilised plot. One sees too many of the latter about nowadays, and the sooner farmers get into the habit of applying even ½ cwt. to the acre the better will their cheques be. It is not only the yield of fodder that matters. The

plots were on rich alluvial land (a twenty year old paspalum paddock), and the results indicate the value of fertiliser on virgin soil.

The new oat Mulga showed up to advantage compared with Sunrise, a similar experience to that in many of the plots last year.

The double cutting of Florence is another instance of what can be done with a very early wheat like this. Fodder was obtained six weeks earlier than Currawa, with a yield from the two cuttings equal to that from the latter. Mr. Smith is showing much enterprise in conserving the greater part of his fodder in pits.

Central-western District.

W. D. KERLE, H.D.A., Senior Agricultural Instructor.

The cultivation of fodder crops for the winter and spring, when natural pastures are usually at a standstill, has not received the attention from the mixed farmer in the past that it warrants. Now that sheep are recognised as a necessary adjunct to the wheat farm, considerable interest is being taken in the question of fodder supply. The prevalence of fungous diseases in wheat is leading to a change in farming practice, the necessity for systematic rotation in an endeavour to starve out these diseases becoming more recognised each year.

In view of this change of practice some definite lines should be adopted by farmers in regard to their sheep. Keeping a few nondescript ewes or wethers just for cleaning weed growth on the fallows is not sufficient, nor is it satisfactory to run a pure line of Merinos for their wool, because of the earth which gets into the wool when grazing on cultivated paddocks. The system which appears the most lucrative and easy of adoption in conjunction with wheat-growing is fat-lamb raising. Moreover, it is the one for which a considerable area of the central west is ideally adapted.

Intimately associated with the production of fat lambs is the growing of green fodder crops for winter and early spring. To secure a maximum lambing, strong lambs, and the minimum of trouble with the ewes, it is essential to have such crops on which to run the ewes sometime prior to and during lambing. It is just as important to have the right class of feed on which to run ewes and lambs, so that the latter will not be stunted, but can be marketed in the pink of condition, and with the much-desired "bloom" upon them.

In an endeavour to popularise mixed farming, and to secure data that will indicate the most suitable winter fodder crops to grow in rotation with wheat, experiments have been conducted for some years by the Department of Agriculture.

The farmers who co-operated with the Department in this work in the central-western district in the past year were:—

Wm. Burns, "Goongirwarrie," Carcoar.
Robinson Bros., Tallawang, Gulgong.
H. B. Loveband, "Blenheim" Coonabarabran.
L. C. J. Broughton, Berrima, Mendooran.
D. McMaster, Oban, Coolah.

Details of the Experiments.

Carcoar.—Soil, granite formation, grey loam; previous crop, wheat for hay; area, 11 acres. Ploughed 24th to 27th January; springtoothed 2nd March; harrowed, prior to sowing, 19th April. The plots were manured with 60 lb. superphosphate per acre, and consisted of:—

1. Cape barley, 1½ bushels seed per acre.
2. Cape barley, 1 bushel seed; Algerian oats, ½ bushel, and Grey field peas, 14 lb.
3. Skinless barley, 40 lb; Algerian oats, ½ bushel; Grey field peas, 14 lb.

The germination was satisfactory, but growth was not fast, owing to exceptionally cold and frosty weather in winter time. There were twenty-three consecutive frosts in June and July. The stocking consisted of forty to fifty sheep for fortnightly intervals from the middle of August to the middle of October.

Tallawang.—Red basaltic loam; previous crop, wheat for grain; area, 10 acres. Springtoothed mid-January and end of February; harrowed prior to sowing on 27th March; 50 lb. superphosphate per acre to each plot. These were:—

1. Cape barley, 50 lb. per acre.
2. Skinless barley, 40 lb., and Grey field peas, 30 lb.
3. Cape barley, 40 lb., and Grey field peas, 30 lb.
4. Skinless barley, 50 lb. per acre.

The germination was satisfactory. First growth was eaten off badly at the end of April by grasshoppers; subsequent growth very good. On 18th August sixty ewes with lambs were turned in for twelve days. Towards the end of September fifty sheep were on for eight days, after which the ground was ploughed for wheat for sowing in May.

Coonabarabran.—Sandy loam soil; previous crop, wheat for hay; mouldboard ploughed end of January; harrowed mid-February and prior to sowing on 22nd March.

The plots, which were not fertilised, were:—

1. Cape barley, 53 lb. per acre.
2. Skinless barley, 53 lb. per acre.
3. Cape barley, 45 lb., and Grey field peas, 15 lb. per acre.
4. Skinless barley, 45 lb., and Grey field peas, 15 lb. per acre.
5. Cleveland wheat, 45 lb., and Grey field peas, 15 lb., per acre.

Plots germinated well, but grew slowly owing to very frosty conditions prevailing. Eventually they provided an excellent lambing paddock for sixty ewes, and later afforded some days' grazing for the ewes and lamb, on two occasions at intervals of about three weeks.

Mendooran.—Sandy soil; previous crop, wheat for grain; area, 12 acres. Soil ploughed end of January; harrowed mid-February and prior to sowing at end of March. The plots, which were unmanured, were :—

1. Cape barley, 45 lb., and rape, 3 lb. per acre.
2. Skinless barley, 45 lb., field peas, 15 lb.
3. Slav rye, 50 lb., field peas, 15 lb.

The germination was good, and feeding-off done by sheep heavily in August and September. The barleys gave by far the best feed, the Skinless, sown with field peas, providing the heaviest bulk of fodder. The growth of rape was not satisfactory. Occasionally good crops of this fodder have been produced, but it is unreliable.

Coolah.—Light red loam of good quality; previous crop, wheat for hay. Sown beginning of April, on land prepared with plough and harrow from middle of January. The plots, sown with 50 lb. superphosphate per acres were :—

1. Skinless barley, 50 lb. per acre.
2. Cape barley, 50 lb. per acre.
3. Cape barley, 40 lb., and Grey peas, 15 lb.
4. Skinless barley, 40 lb., and Grey peas, 15 lb.

Dairy-farming is carried out on this farm, and the above fodders proved most advantageous in feeding to milking cows, a big increase in the milk flow being immediately noticeable when they were turned on to graze. As a result of this, the first season's experiments, Mr. McMaster has decided to sow a considerable area in future, with the object not only of providing a continuity of feed for grazing, but, should the season promote sufficient growth, allowing for the laying-down of several pits of silage.

Comments.

The experiments have proved conclusively the necessity of winter fodders for all classes of stock, and that they provide an excellent rotation with wheat on the mixed farm.

In the control of fungous diseases the system of rotating wheat with winter fodder crops of barley or oats has proved an excellent one. In this particular oats are the most beneficial. Owing to the early maturing varieties which have been produced in late years, *e.g.*, Sunrise, Mulga, and Lachlan, it is possible they will largely supplant the barleys as winter fodder crops. Barley is much more exacting in its soil and water requirements than oats, and does not provide any bulk of feed in the second growth. If the feed is not required for some time after grazing, the oat paddocks may be shut up, and will produce a payable hay crop.

Winter fodders should be sown systematically each year. Should the paddocks not be required for grazing, owing to abundance of natural pasture, the crop may profitably be preserved in the form of silage. This is the best insurance against the drought which is bound to come sooner or later.

In the central-west, more mixed farmers should be going in for fat-lamb raising. This industry, for which a profitable and steady market exists, appears the most suitable for the wheat-farmer, who, by rotating in a systematic manner his wheat and winter fodder crops, is able to produce succulent fodder when he most requires it, and not at the expense of the wheat crop.

Murrumbidgee Irrigation Areas (Griffith Centre).

E. B. FURBY, H.D.A., Agricultural Instructor.

During the 1924 season, trials with winter green fodders were conducted with the co-operation of the following settlers :—

S. H. Kelly, Farm 529, Yenda.
W. Wallace, Farm 417. Yenda.
H. J. Murray, Farm 24, Griffith.

An outstanding requirement of the dairy-farming on these areas is winter feed in large quantities for the cattle. That there is a certain difficulty in providing such feed is too well-known, the circumstance being usually attributed to local peculiarities associated with both soil and climate, and to the fact that the crops are grown under irrigation, which introduces certain difficulties in production not found elsewhere. The object of these trials, however, is to ascertain the suitability of varieties under these conditions, and their capacity to fulfil the requirements of the industry.

An endeavour was made to have these plots sown early in the season, so that early winter grazing could first be obtained, and afterwards a reasonable cutting. Sowing did not take place till the first week in May, and only in one case was grazing carried out, viz., on Farm 24, where it was done late in the season, and a second growth fit for cutting did not come away. Consequently, no yields are shown for this plot, though some information as to the grazing features of the various crops was obtained.

Between sowing and harvesting in October, rain amounting to 568 points was recorded. After sowing, a short, dry spell, followed; germination was slow and early growth somewhat retarded. Again, in the spring short, dry spells kept the crops backward, and, although irrigation was resorted to on Farms 417 and 529 in September, the crops were then beyond the stage where they would receive the maximum benefit therefrom.

Fallowed ground was used. In the case of Farms 24 and 417 only a short fallow was given, while on Farm 529 the ground had been fallowed for twelve months.

The difference in the yields from the two farms points distinctly to the advantage of the long fallow, which should, wherever practicable, be adopted.

The practice of ploughing the ground just before sowing the crop must always be deprecated. Thorough preparation of the soil, based on good, sound principles, is one of the first essentials to growing good crops, irrespective of the class of land. In addition to this, having the ground in order early in the season enables the grower to take advantage of any rain which may fall to aid him in getting his crop in under the best conditions, in spite of the fact that irrigation water is available practically any time to give him the necessary soil moisture content.

In sowing these plots the following rates of seed per acre were adopted :—Wheat, 75 lb. per acre; rye, 90 lb.; oats, 60 lb.; barley, 50 lb.; vetches and peas (in mixtures), 30 lb.

Although the difference in the yields of the various crops was not outstanding, except perhaps in the case of rye, the oats and legumes in mixtures stood out very prominently as an ideal mixture, in view of the quick growth and flaggy habit. As to choosing between vetches and peas, there was practically no difference as far as could be seen in the density of the legumes. On Farm 24, where the crop was grazed, the cows appeared to prefer the peas, though readily eating the vetches.

Cape barley showed up more to advantage this season than previously When grazed it was found that it did not have such good after-growth as oats or rye. Skinless barley was also sown in the trials, but grew very poorly; ripening very quickly, it was beyond the best cutting stage when the other plots were harvested.

Firbank wheat and vetches gave a very low yield on Farm 417. The crop was very sparse, having germinated poorly, and in view of Firbank not being a good stooler, it is considered that a heavier sowing per acre should have been made. When grazed, the cows showed a preference for the wheat, no doubt on account of its sweetness. It was soon eaten out, and only made a poor second growth.

Rye is not grown to any extent on the areas. From the yield it appears as if it is not a heavy yielding crop, though it grew to a great height. For early feeding, with quantity and succulence, no plot looked so promising as did rye. For the settlers branching out into sheep-farming, this crop, sown with either peas or vetches about the month of March, will furnish good grazing, if not overstocked, right through the winter. The grazed crop on Farm 24 showed that it would stand fairly heavy grazing, and was particularly favoured by the cows.

The yields from the plots harvested were as follows :—

	Farm 529.				Farm 417.			
	t.	cwt.	q.	lb.	t.	cwt.	q.	lb.
Firbank wheat and vetches ...	5	5	0	0	2	14	1	0
Cape barley	5	12	2	0	3	9	2	12
Black Winter rye	4	13	0	24	2	4	3	0
Mulga oats, and peas	5	8	1	6	3	13	1	26
Sunrise oats and vetches ...	5	11	1	2		......		
Sunrise oats and peas		......			3	8	0	0

Does Fallowing Pay?

E. A. SOUTHEE, Principal, Hawkesbury Agricultural College.

If there still be any farmers who are disposed to ask whether fallowing pays, they have the answer in the testimony of scores of successful men in all parts of New South Wales. Positive evidence is welcome, however, and we have it in figures kept since 1903 by Mr. W. W. Watson, of Tichborne, near Parkes. During almost the whole of that time Mr. Watson has consistently adopted fallowing as a cultural method, omitting to do so only for a couple of years early in his farming career, and he has separately recorded each year the yields from fallowed and non-fallowed land on his farm.

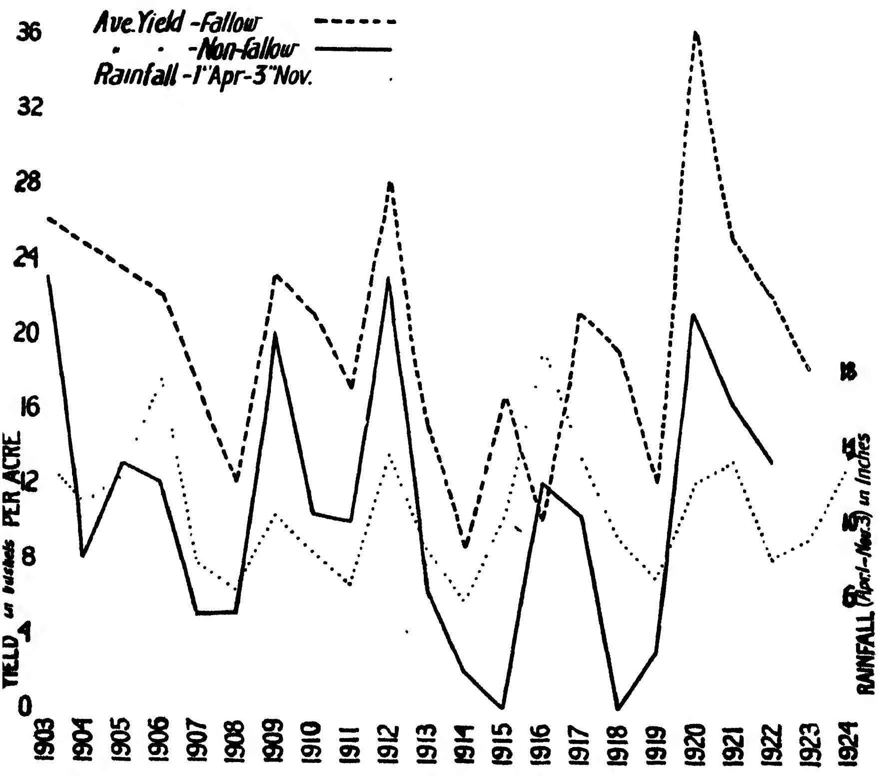

Chart No. 1.—Comparing yearly productions per acre from fallowed and non-fallowed land, and showing the total rainfall for the period 1st April to 3rd November in each year.

The figures were given a few years ago in the *Agricultural Gazette* by Mr. H. Bartlett, Senior Agricultural Instructor, but just lately Mr. Watson was good enough to supply the records of his operations for the seasons 1921

to 1923, and charts have been prepared for use at the College expressing the results in such an effective form that it was thought they would also interest readers of the *Gazette.*

For the harvest just completed the average yield on the farm was 30 bushels per acre—all being on fallow, so that had the line that indicates the yield from fallowed land been extended to represent 1924 it would have terminated in a sharp rise. The rainfall for 1924 was 25·77 inches, of which 8 inches fell within four weeks of the first week in November.

It will be observed that the chart shows no return from stubble land for the past two years. This, says Mr. Watson, is intentional, as he does not consider it pays to grow wheat on stubble land in districts like Parkes.

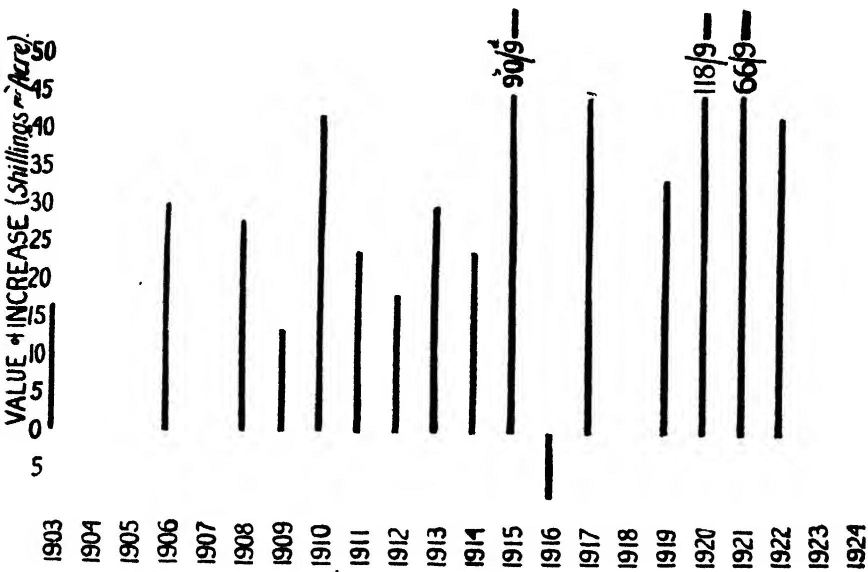

Chart No. 2.—Showing the value of the increased yield each year resulting from the practice of fallowing. In one year the return from the fallowed land was a little less per acre than that from the non-fallowed.

It will also be observed that the average yields for the past four years have been far above any other period. This Mr. Watson attributes in the first place to the adoption of improved cultural methods, and in the second place to the use of superphosphate.

Chart No. 1 shows the average yield in each year from the fallowed land on the farm, the average yield from the non-fallowed land, and the rainfall for the period 1st April to 3rd November in each year.

Chart No. 2 expresses the difference between the value of the yields from non-fallowed and fallowed land. To arrive at this comparison the price per bushel quoted in the Official Year Book for each year has been taken. It will be seen that in some years the difference was very substantial, reaching 118/9 per acre in one year. Only in one season (1916) was the difference between the two methods of cultivation in favour of non-fallow, and that was

due to excessive rains (13 inches between September and December) causing the very heavy crops on fallow land to lodge. It is estimated that, including interest on the land for the whole period, a fallowed crop costs about 6/3 per acre more than a non-fallowed crop, so that (apart from other respects in which fallowing is undoubtedly the best method) fallowing has paid Mr. Watson very handsomely in the twenty-two years.

A Dairy-farmer's Inquiry.

"Will you please forward me a copy of "Summer Leguminous Crops," wrote an Aberdeen correspondent recently. "What I want is a crop to sow between rows of growing corn about the time of the last cultivation. I want to feed the corn to cows in the milky stage of the grain about the end of March, by cutting and carting it off to them, and I want a leguminous crop to be growing all the time, so as to be ready for feeding off in the early spring. What is the best crop in your opinion for winter growth on the Upper Hunter? I also want a crop to sow after Sudan grass in March or April."

It was doubtful, the writer was informed, whether much was to be gained by sowing a cover crop in maize which it was intended to cut for green feed a month or so later, as such a crop would make very little growth under the shade of a heavy crop like maize, and the trampling it would get during the harvesting of the maize would probably destroy so much of the young tender cover crop as practically to necessitate re-sowing it.

Field peas or vetches were mentioned as about the best leguminous crops for sowing after maize for fodder or after Sudan grass in March or April; they should be sown alone if the main idea was soil improvement rather than the provision of fodder or grazing for dairy cows in early spring. If, however, the question of providing grazing was regarded as more important, a combination of oats or wheat and field peas or of rye and vetches would be better. The latter combination was more suitable for providing continuous light grazing, while the former combination would be better if the crop was to be allowed to develop for feeding off at once.—H. Wenholz, Special Agricultural Instructor.

The Feed Value of Damaged Grain.

Shrunken and damaged grain has a relatively low market value, but for feeding purposes it may be nearly equal to the plump sound grain, which commands the higher price. Pinched or shrivelled wheat grains contain, as a rule, a slightly higher percentage of proteins than the plumper grains, and are for this reason a valuable food for poultry.

The feeding value of grain that is "shot" will depend on how far germination has proceeded. A bleached and "shot" sample was lately submitted to the Department with the question whether it was suitable for poultry food, and the reply was that though it would not have the same food value as sound wheat, it was unlikely to have any deleterious effect on poultry.—A. A. Ramsay, Chemist.

Maize-growing for Silage.

A Competition at Tilba.

H. WENHOLZ, B.Sc. (Agr.), Special Agricultural Instructor.

TILBA has already made itself famous among the dairying districts of the State by its progress in the building of silos and by the comparatively advanced methods of feeding dairy cows that are practised.

It has now enhanced its reputation as a progressive centre by its agricultural society being the first in the coastal districts of the State to organise a field maize competition for the heaviest yield of the best quality of green fodder or silage maize, and incidentally, by means of the judging, to have the methods of cultivation and general practices in growing the fodder crops assessed with a view to their possible improvement.

With such a worthy object the Tilba A.P. and H. Society departed from the plan of crop-growing competitions previously obtaining, which judged on yield alone and merely served to bring out as the winner the fortunate individual who possessed the richest soil and grew the heaviest crop regardless of methods, cost, and quality of crop.

The present competition was organised by the society mainly for its educational value, and the Department was asked to suggest a score card or scale of points for use in the judging of the crops which would, in addition to points for yield, give credit for cultivation methods, excellence of stand, absence of weed growth, quality of fodder, freedom from insect pests and diseases, and other characters generally influenced by good farming methods. The educational value of the competition was enhanced by the society requesting the services of a field officer of the Department to act as judge. The Tilba farmers have always had happy relations with the officers of the Department, favourably regarding helpful advice and suggestions on farming practice from its instructors, and the contact of the Department in these competitions with farmers on their own farms is not without its benefit to such officers, helping them to appreciate more of the individual difficulties and problems confronting the men on the land.

The Season.

The season generally was not as favourable as it might have been, being very dry right up till the end of December, and then setting in very wet. In fact, when the dry season broke the weather was so inordinately cool and wet that the crops matured very slowly, and the task of keeping down weeds was made rather onerous and difficult. These conditions did not favour a heavy entry in the competition, many farmers withdrawing their projected entries because they did not care for only moderate crops to be seen or because they were somewhat over-conscious of the weed growth which was present in their crops.

It was desired that the crops should be judged before the Tilba Show in February, and it was unfortunate that the cool season had so delayed the maturity of the crops that not only was the estimation of the yield of fodder more difficult at that time, but it was also harder to determine the condition and character of the fodder than it would have been at the ensilage stage, which was three or four weeks off still in many of the crops. Under ordinary circumstances, with a normal season, the crops would have been near the best ensiling stage and the judging would have been easier.

The Crops.

Despite the partly unfavourable season some surprisingly good crops were seen. It was generally agreed that the season showed definitely that maize crops can get too much rain during their growth, even fodder crops, for the crops in the district the previous year with less rainfall were ever so much better. It is doubtful whether, with all the rainfall, there would have been an excess if the accompanying weather had been warmer and had facilitated the drying of the ground and enabled better cultivation to have been given to keep down the weed growth. One factor that is perhaps overlooked is that the dry winter and spring, combined with cultivation methods which generally did not turn these conditions to the best account, did not give the crop a good start, without which no crop will attain its best growth.

The outstanding crop, for yield especially, was grown by Messrs. A. Bishop and Sons on drained swamp land which is in the stage of getting over its objectionable excess of peatiness on the surface by cultivation. The yield of the best crop here was estimated at 45 tons per acre, equalling the authentic record yield of green fodder maize for the State, which was also obtained at Tilba several years ago. Although estimated at 45 tons, it is considered that this crop would go even heavier by the time it reached the ensilage stage, as at the time of judging the cobs had not developed very greatly. The heavy yield of green fodder on this class of land in such a season draws attention to the possibility of draining and utilising further swamp areas in this district.

Some of the other yields on the hill soils of igneous derivation were creditable under the circumstances (those of Messrs. A. Negus and H. J. Bate on such soils being estimated at 25 tons per acre), especially as they will be greatly improved upon in better seasons, and with better cultivation and cropping systems.

Systems of Cropping.

It may be regarded as a tribute to the natural fertility of the hill soils in the Tilba district, on which the bulk of the maize crops are grown, that they have been raising fodder crops of maize continuously (in some instances with an occasional crop of oats between successive maize crops) for a period of fifteen or twenty years. Such continued cropping on the hill soils in this district, without much attempt at restoration of the loss of fertility and organic matter which is taking place under these circumstances, is already showing its effect on the soils, and can have only one ultimate issue—increased

difficulty in the all-important job of filling the silos on the farm with such a small area of cultivation as is being used at present. Apart from the fact that these cultivation areas are often circumscribed on many Tilba farms, the greater economy of being able to fill the silos from small areas needs no special emphasis, and the wisdom of adopting methods that will make it attainment possible will be readily seen.

Portion of Messrs. A. Bishop and Sons' Winning Crop at Tilba
Estimated yield, 45 tons per acre.

A commencement in the improvement of the fertility of the hill soils of Tilba needs to be made at once, for the problem must not be allowed to become acute or lead to too serious disorganisation of the practicable or economic systems of cropping on these farms. Such a position is bound to arise if the soil fertility is allowed to become too exhausted, for it is a difficult and costly business to bring worn out land back to profitable cultivation.

Some suggestions as to the steps which might now be taken by Tilba farmer to maintain or improve their soil fertility on the hill lands will be given at the close of this report.

Points for Cultivation Methods.

In a competition of this kind, it seems essential that points should be given for methods of cultivation. This seems necessary for two reasons.

Firstly, it is apparent that a competitor with exceedingly fertile natural soil may gain so many points for yield as to render the chances of farmers with moderate soils hopeless, for no matter how commendable may be the methods of the farmer on the poorer soil, the crop grown on the naturally rich soil may exceed the other in yield even when the cultivation has been poor or neglected. The absence of points for cultivation methods would so discourage the farmers on the less fertile soil that they would not be inclined to enter their crops, and a good deal of the value of the competition would be lost.

Secondly, a comparison of the cultivation methods and the report thereon with suggestions for their improvement by the judge is one of the main educational features of such competitions, and it is felt, moreover, that many farmers enter their crops almost with the sole object of obtaining the opportunity of coming in direct contact with the judge for the possible helpful advice and suggestions he may offer them on the spot when the individual conditions of soil, cropping and cultivation methods can be discussed. It is often found that these differ justifiably from the standard, because of peculiar or particular conditions in the environment which necessitate special treatment for the best results.

The final result of such a competition is, or should be, to encourage good farming methods, and the competition points should be drawn up and used in such a manner as to give the farmer who is doing the best under his circumstances the greatest encouragement.

Included in the cultivation methods for which points were given were such items as the time and depth of the first ploughing (taking into consideration the nature of the previous crop), the methods of cultivating the soil after the first ploughing up till planting time (which practically means the methods of fitting the seed-bed), and the methods of cultivating the growing crop. In the present system of allotting points, those given for cultivation methods are not dissociated from those given for the cleanness of cultivation, and having regard to the previously emphasised importance of giving points for cultivation methods, which in many cases stand in need of improvement in the coastal maize crops, and also after the experience in judging by this system, it would seem a wise course to dissociate these points (chiefly for educational purposes) and even to augment them in future schedules.

Cultivation Methods Adopted.

With the exception of two crops, the time of the first ploughing of the land was generally too long delayed to expect the best results. This was all the more noticeable because of the dry winter and spring, the delay in the

ploughing in such a case having a much more adverse affect on the subsequent crop than if the winter or spring had been wet. This delayed ploughing not only caused greater difficulty in fitting the seed-bed in such a dry spring but produced a marked lack of moisture in the soil for the young crop to develop on in the early stages. This was not without its initial effect on the germination, which was observed to be much better generally where early ploughing was given, but it was also subsequently observed that a better start was obtained by the crops on longer fallowed land, which enabled them to jump away more quickly when the dry spell broke, and to shade the ground so quickly as to prevent largely the development and growth of weeds. This was particularly observable in the crop of Mr. Negus, which was the cleanest

Another Crop in the Competition.
Grown by Mr. P. Southam.

crop seen in the competition, and for which this seems the only feasible explanation. Mr. Bate's crop would have been in the same condition (being the only other crop in the same category as to early ploughing), but for its suffering more from weed growth, perhaps, largely because of a poorer germination, not itself any fault of seed-bed preparation but due to bad seed.

In the crops sown on late-ploughed land the germination and weed growth were generally bad—a very late ploughing in the case of Mr. Southam's crop being responsible for the worst germination and its attendant ills of weed growth and coarseness of fodder, which marred an otherwise good crop.

There is an impression in the minds of some Tilba farmers on the hill slopes that a great risk of soil washing is concurrent with leaving the land to lie fallow for any length of time. Without being altogether unmindful of this danger, it must not be forgotten that the cardinal principle involved in soil erosion is that the greater the moisture-holding power of the soil the less is it likely to suffer from erosion. Factors which increase the moisture-holding power of the soil on these hill slopes are worth consideration. Deep ploughing, increasing the organic or vegetable matter in the soil, and ploughing across the slope of the hill will alleviate the trouble from soil washing considerably, in addition to having the justification of good farming practice. Many good Tilba farmers realise the importance of early ploughing, and do not greatly fear the danger from erosion, which some connect with it, though it is necessary to watch it on very steep cultivation slopes.

One more point concerning ploughing requires to be touched upon. Generally the shorter the fallow period between ploughing the land and planting the crop, the shallower should be the ploughing for the best results. This is alterable to some extent, depending on the moisture in the soil at ploughing and the subsequent cultural operations given to the land before planting, but the underlying reason for this should be borne in mind, viz., that a very deep and very loose seed-bed at planting should be avoided at all times. Conversely, the opposite axiom is true; that is, the longer the fallow period the deeper the first ploughing can be, because there is more time (and methods can be adopted) to get a firmer seed-bed by planting time. In the crops under review, a deep ploughing in November in one case followed at once by planting could not be expected to be productive of the best results, especially in such a dry time.

The cultivation methods following ploughing should be largely designed for conserving soil moisture and obtaining a suitable and efficient seed-bed, together with the encouragement and subsequent destruction of weed growth, and the after cultivation should be concerned largely with the destruction of weeds, particularly when young. Generally speaking, the attention of Tilba farmers to their cultivation operations under these heads was quite good, especially under the circumstances, and there were but few lapses to which reference can be made here.

Cleanness of Cultivation.

As previously mentioned the season was altogether against the production of highly clean crops. Fat-hen (*Chenopodium* sp.) was the most prevalent weed, being present in practically every crop. Another weed which was also seen in most crops (very bad in some), and to be classed as one of the worst weeds of coastal cultivation, is the species of amaranth known variously as Prince of Wales' feather, "red legs" or Boggabri. The bad features of this weed are its tough hold on the ground (due to its long tap-root and its hardiness in restriking quite easily if not lifted entirely or its tap-root cut) and its guileful habit of maturing seed while the heads appear to be still so green.

Such a bad weed as this deserves a little attention in hand hoeing, care being taken to get at it early on the above account to prevent it scattering seed. On the drained swamp land barnyard grass and docks are added to the list of weeds, and wild mustard appeared in a few crops as the result of a previous crop of oats, in which this is a common weed. Crops in which the amaranth weed was present, and especially if seeding, naturally lost more points.

A noticeably bad feature of practically all the crops, even those which had been given much cultivation and were comparatively clean, was the thick unchecked riotous growth of weeds, many of which were seeding heavily, on the headlands. Apart from the fact that the crops entered in a competition such as this must to a certain extent be regarded as show crops whose appearance and surroundings should look well, a store of trouble is being set up by weeds (many of them bad ones) seeding freely on the headlands and the seed being carried further on to the land by subsequent cultivation operations.

Varieties.

Although it was not the variety used in the winning crop, Pride of Hawkesbury was the most popular variety, the only other varieties entered being Fitzroy and Hickory King. The progressiveness of the Tilba farmers in getting on to Pride of Hawkesbury as a fodder variety is to be admired, for this is undoubtedly a heavy yielding variety. Where bulk is the main thing required (as it is in silage maize), Pride of Hawkesbury is well worth a place, for it is probably the heaviest yielding variety of maize for fodder to be had for good soils in the coastal districts of New South Wales to-day. It has the advantage further, if the soil is very rich and the stand somewhat thin and big cobs are produced, of having long narrow cobs which pass more easily through the cutter than the short thick cobs produced by other varieties under the same circumstances.

There are, however, two or three objectionable features concerning Pride of Hawkesbury which may possibly be overcome. In the first place, the variety is a very soft-grained one, which has a poor husk covering and of which the seed spoils very easily, and, to the annoyance of the farmer handling the seed, in a very unobtrusive manner, appearing quite sound on the cob, but showing a black, mouldy or dead germ when shelled. The result of this characteristic is that much bad grain gets into the seed sample unless extreme care is used in selecting and shelling seed maize of this variety. That this was the cause of faulty germination in some of the competitors' fields where this variety was used there is no doubt. Pride of Hawkesbury suffers also by comparison in its inability to stand green or "hang" in the ensilage stage as well as Fitzroy and some other varieties. This is chiefly on account of the more pithy nature of its thicker stalks and probably also because it is not quite so resistant to diseases like leaf blight, dry rot, and stalk or root rot which affect the quality of the fodder to some extent. It also remains to be seen whether Pride of Hawkesbury is going to be so well

suited to the only moderately fertile igneous hill soils or to the comparatively poorer hill soils of slate derivation. Present indications are somewhat against it under these conditions.

Fitzroy is a variety which is difficult to oust, the crop comprising the winning plot being remarkably good fodder, uniform, and free from disease. This variety has the advantage, too, of producing a beautiful sample of seed, and its finer more succulent stalks make it very acceptable when there is an excess of material for the silo and some of it has to be utilised as green fodder. In some quarters it is thought that Fitzroy is more subject to maize smut than other varieties, but any occurrence of greater prevalence in this variety cannot be regarded as more than accidental coincidence at present.

Hickory King is apparently rightly grown by those farmers who have the less fertile soils in this district. Being of a hardy nature, it will probably make more growth than most other varieties, particularly in seasons of limited or short rainfall. If the soil is sufficiently fertile, however, it is considered that other varieties, such as Fitzroy, would yield better.

It is doubtful whether any other varieties of maize are worth trial in this district for silage, but before closing the chapter, it may be as well to refer to the possibilities of Ulmarra White Cap or White Cap Horsetooth for the bottom lands and the better hill soils, and of Cocke's Prolific for the moderately fertile hill soils where Hickory King is now so popular. These varieties may not be any improvement on the existing ones in use, but they are definitely worth testing. The former variety is the maize largely grown for grain on the Clarence River, and there it seems to make a heavier growth of stalk than Fitzroy. Cocke's Prolific is a white variety which has long, very narrow cobs, with a tendency to produce more than a single ear per stalk with the slightest encouragement, and has been giving fairly good results for fodder in other parts of the State.

Rate of Seeding.

Generally speaking, it seems that the Tilba farmers are inclined to adopt too low a rate of seeding for their silage crops. This is largely deliberate on their part under the belief that by getting some good development of cob on the stalks, the fodder or silage produced is of much greater feeding value, as it is thought that the cob is of more value in this respect than the rest of the plant. There is, as a matter of fact, a slightly greater feeding value in the ears, and this is accentuated as the crop matures, because there is a translocation of material from the leaves to the cobs as the grain hardens, contemporaneously with which the leaves (particularly the bottom ones) dry off. These facts cannot be taken advantage of here to the extent that they can in America, where, on account of the greater height of the silos (up to 30 or 40 feet) the material is subjected to greater pressure, and being also put in very expeditously the crop can be allowed to mature further and still make good silage.

At the comparatively earlier stage at which maize has usually to be ensiled here because of the slower rate of filling and the lower height of the silos, there is not a great difference in the composition and feeding value of the ears and the rest of the plant (the leaves at least), and the intentionally thinner planting to get a good development of ears must assuredly be tending in the direction of getting less food value from the crop per acre on land where a thicker stand could be supported with a marked increase in the yield of the crop. One or two crops were, however, quite satisfactorily seeded, that of Mr. Negus on hill soil being very good in this respect. This was particularly noticeable because the variety used in this instance, Hickory King, is difficult to seed thickly on account of the large size of the seed, unless special arrangements are made to get a suitable plate as well as a small sprocket for the maize drill.

On the poorer slate soils and the lighter granite soils of this district an increase in the rate of seeding requires to be carefully watched, for such land will not stand the thick seeding of better soils. It is on the better soils and on the bottom lands particularly that the seeding can with benefit be increased. It seems bold to suggest that a seeding of 8 inches apart in rows 3 feet apart, as in the winning crop, could be increased; but in a crop yielding over 40 tons per acre, running over 15 feet high, with individual stalks weighing 5 or 6 lb. it seems that it could. It is at least worth a trial. The other crops on bottom land could certainly have been seeded much more thickly with great advantage.

Insect Pests and Disease.

Not much sign of insect damage was seen in any of the crops with the exception, strange to say, of what turned out to be the winning crops of Messrs. Bishop and Sons. Here, particularly in one crop, maize-ear worms were abundant, and the voracious manner in which they were feeding indicated that some measures would soon have to be taken to stop their further damage to the crop. These caterpillars are generally worst in a wet summer following a dry spring, and the best means of dealing with them is to plough the land soon after the crop is off in autumn to break up the pupating furrows in the soil, relying on birds and other natural enemies to help further in their destruction.

Reference has already been made to some of the fungous diseases. Although maize-head smut (*Sorosporium*) is known and to some extent justifiably feared in the district, it was only evident to a slight extent in some of the crops. A mistaken notion prevails that some varieties (among them Fitzroy) are more susceptible to this disease, and also that the fungus is largely carried on the seed, and it is suggested by some (though it is not known to be carried out) that treatment of the seed with bluestone should be effective. This, however, is of little value since the spores live over in the ground from previous or neighbouring crops from which they have been blown. Comparatively little is known regarding the best means of control

of this disease. It has been discovered that the spores will live over in the soil for some years and that they are still viable after passing through stock. The spores of the American maize smut (*Ustilago*), which we are fortunately free from in this country, are known to be definitely killed by the acids in silage in a few weeks, and if this is the case with the head smut the disease is naturally kept somewhat within bounds in a silage district like Tilba, and would be better controlled if smutted tassels were cut off and burnt before they shed spores whenever they were noticed in the crop.

Signs of other fungous diseases, such as dry rot, stalk or root rot, and leaf blight were in evidence to a greater or less extent in most of the crops, and these diseases, which detract from the quality of the fodder to some extent, while they may have been more apparent than usual in such a wet season, may be better controlled by better methods of crop rotation and seed selection.

The Results.

The following table gives the points scored by each crop under the different heads :—

Competitor.	Germination or Stand.	Cultivation Methods and Cleanness of Cultivation	Leafiness and Production of Ears.	General Appearance, Evenness, &c.	Character of Fodder	Freedom from Insect Pests and Disease	Estimated Yield	Total.
Maximum points	10	25	20	10	15	10	*	
A. Bishop and Sons (1) ...	9	17	18	9	12	8	45	118
" " (2) ...	9	16	18	9	12	6	40	110
A. Negus	10	20	18	9	13	9	25	104
P. Southam	7	13	17	8	12	10	30	97
H. J. Bate	7	19	16	9	11	8	25	95
A. H. Mead	9	15	16	9	13	10	17	89
R. Read...	6	11	16	7	11	10	20	81
R. Hapgood	7	14	12	6	10	9	15	73

* One point for each ton of green fodder per acre (estimated).

The Winning Crop.

The winning crop of Messrs. Bishop was grown on a drained swamp soil of a dark peaty nature, which had only been broken up two years and had previously grown a crop of potatoes. The land was ploughed for the maize crop about the beginning of September, 6 or 7 inches deep, and was disc-harrowed four times and rolled once to fit the seed-bed. Planting took place about mid-October in drills 3 feet apart with 8 inches between the plants, the variety being Fitzroy. Four scufflings and three chippings were given the crop.

The crop was one of the finest crops of fodder maize ever seen in the State, and its success in this competition was due to its general excellence in yield, character, and appearance, combined with praiseworthy methods of cutivation and attention.

Mention must be made of the creditable showing made by A. Negus with his crop on hill land. This was the best crop on upland soil. With better methods of cultivation and the application of methods to increase the soil fertility to make heavier yielding crops, the indications are that some of the crops on the hill slopes in the Tilba district will go yet nearer winning a competition of this kind and incidentally demonstrate not only the capacity, but the excellence of these soils under good treatment for the all-important job of growing the fodder to fill the silos on the Tilba dairy farms

Improving Soil Fertility.

At the risk of lengthening this report, it is felt that the paramount importance of maintaining or improving the fertility of the hill soils in the Tilba district justifies the inclusion of some brief suggestions as to how this may be accomplished. It must be conceded that heavy crops of fodder-maize under cultivation tender to drain the resources of the soil fertility just as quickly, if not faster, than crops of maize for grain, seeing that the whole of the growth of the crop is removed from the soil in the first case, while in the latter some part of the stalk growth is returned. Under the heading of soil fertility which becomes depleted must be considered organic matter (the loss of which affects the tilth and moisture-holding power of the soil) and plant food.

The following suggestions are given very briefly for consideration by Tilba farmers on this phase of fodder crop production :—

1. Spelling the land for a number of years with pasture or lucerne if practicable.
2. More systematic use of cow manure as a dressing on the small cultivation areas.
3. The use of short period catch crops for green manuring or grazing, such as summer legumes (cowpeas, soybeans, &c.) after oats or winter legumes (peas, vetches, annual clovers, &c.) after maize.
4. Long period rotation crops, such as biennial clovers, which serve the double purpose of materially augmenting the soil fertility and of providing leguminous hay or grazing of high-feeding value. Supplemental feeds of high protein content, such as legume hays, are urgently needed on Tilba farms to balance the carbonaceous silage and to save the heavy cost of purchased concentrates.
5. The use of the right fertilisers.

Until these methods of improving the soil fertility have been carefully tried out in the Tilba district to determine their economic value, practicability, and effect on the yield of the main crop of fodder maize, they are unlikely

to go into the regular farming practice, in which the absence of one or more is to be deplored. For the sake alone of preserving the fair name which Tilba farmers have made for progress, experiments along one or more of these lines should be initiated without delay.

Conclusion.

It is only after actual experience with a score card in judging that one can find the merits or faults of its compilation. While the scoring schedule used in this case was fairly satisfactory, it is open to some improvement in the dissociation of the points for cultivation methods from those of cleanness of cultivation and the increase of each as mentioned, with a few other minor alterations which would bring the schedule to the following, which is suggested for future competitions of this kind :—

	Points.
Germination	10
Cultivation methods	25
Freedom from weeds	15
Leafiness and production of ears	15
Character of fodder	10
General appearance, evenness, &c.	10
Absence of insect pests and disease	10
Estimated yield (one point for each ton per acre of green fodder).	

Curing the Lemon.

The fruit must be picked carefully—not handled like potatoes, but more after the manner of handling eggs, as decay is liable to set up in any bruised part. The fruit should be stored away in well-ventilated, dry, cool buildings, either in boxes or trays. It is always easier to store small than large quantities; therefore the larger the quantity the more careful the grower will have to be about the building in which he keeps his fruit. A small closed room may be a capital place in which to keep a few lemons, but perhaps not at all suitable if the room is filled with fruit. We neither want the lemon to sweat, nor do we want it to shrivel, and if we can strike the happy medium we are on the right track. It has been demonstrated both here and in California that lemons keep best when cut just as they are beginning to turn ripe, and that, on the contrary, they do not keep so well when allowed to hang until quite ripe. They are best cut as soon as they are about 2½ inches in diameter. When they are over 2¾ inches they are over size, except for making lemon peel, when a good thick-skinned 3-inch lemon suits admirably. But we are now talking of lemons for curing, and for this purpose they should be picked when they attain the proper size, even though almost green. They should be allowed to stand for a few days and then packed away in paper-lined boxes, which may be stacked in blocks in such a manner as to permit a free circulation of air around each case.

The lemons should be cut off (not pulled) in such a way as to leave a small portion of the stalk adhering to the fruit.—W. J. Allen.

Lamb-raising Trials, Season 1924.

E. A. ELLIOTT, Sheep and Wool Instructor.

Cowra Experiment Farm.

EXPERIMENTS were carried out this season on the same lines as last year. As the ewes on the farm were aged, they were disposed of, and a flock of 4-tooth Border Leicester x Merino ewes was purchased. An average price of 22s. 1d. per head was obtained for the aged ewes, while the young ewes, which are a very even line, cost 27s. per head. The new line of ewes was divided between this Farm and Bathurst Experiment Farm.

The flock at Cowra consisted of 280 ewes, which were divided equally, one lot being mated with Dorset Horn rams and the other with Ryeland rams. Two per cent. of rams was joined on 15th January, and it was intended that mating should cease on 26th February, but owing to the death of two aged Dorset Horn rams during mating, and a slight delay in their replacement, the mating period did not end till 26th March. As will be seen later, this interruption in the mating period appears to have affected the mating percentage of the Dorset Horn cross. The ewes were running together after mating until three weeks before lambing commenced.

At mating time and right throughout the year the ewes were in excellent condition, and there was always abundance of feed.

Lambing commenced on 17th June, but only six lambs were born in the first week. On account of the delay in mating, lambing did not finish till 15th August.

From lambing to marking time nine Dorset Horn cross and twenty-two Ryeland cross lambs died. The total number born in each cross was : Dorset Horn cross 86, and Ryeland cross 143. There were nine pairs of twins in the Dorset Horn cross and fourteen pairs among the Ryeland cross. One ewe of the Ryeland lot died during mating from unknown causes, and two of the same lot died from parturition trouble at lambing time. The following table gives particulars of the lambing :—

Cross.	Ewes mated.	Deaths of ewes from parturition.	No of lambs born.	Pairs of twins.	Deaths before marking.	No. marked.	Percentage marked.
Dorset Horn	140	...	86	9	9	77	55
Ryeland	140	2	143	14	22	121	86

The lambs were weighed three times, the first being done on 13th August. At this weighing, and each one following, it will be seen that the Dorset Horn cross lambs gave the best weights. In appearance also this was the best cross at all times during the growth of the lambs. A feature of the appearance of the lambs this year was the close resemblance in form to their

mothers. In previous years both crosses have been easily distinguishable but this year this feature was much less marked. The weights at the various intervals were as follows:—

Breed of lamb.	Average Weight.						Average Increase in 83 days.	
	13th August.		2nd October.		4th November.			
	Ewes	Wethers.	Ewes.	Wethers.	Ewes.	Wethers.	Ewes.	Wethers.
	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
Dorset Horn cross ..	37·1	39·8	56·1	62·1	82·7	86·7	45 6	46·9
Ryeland Cross... ..	32·6	34·3	51·3	56·4	76	72	43·4	37·7

The lambs were again marketed in two drafts, the first draft (the fifty best lambs of each cross) being sold at Flemington on 13th November. There was a big yarding of lambs, and prices were not so high as at later sales.

The final draft of lambs was sold on 18th December, and was composed of twenty-six Dorset Horn cross and sixty-six Ryeland cross. In this lot some of the lambs of each cross were on the light side. Three of the Ryeland cross and one Dorset Horn cross were retained as unfit for sale. Two Ryeland cross lambs died between marking and marketing. The prices realised at each sale were as follows:—

Breed of lamb.	First draft.		Second draft.		Combined average price.
	No.	Average price.	No.	Average Price.	
		s. d.		s. d.	s. d.
Dorset Horn cross ...	50	37 4	26	33 10¾	36 2
Ryeland cross	50	35 2	66	30 11¾	32 9¼

The following table shows the net return per ewe mated:—

Breed of lamb.	Ewes mated.	Lambs sold.	Average price per lamb.	Value of lambs unsold.	Ewes died at lambing.	Value of ewes per head.	Total value of lambs.	Less value of ewes died.	Average return per ewe mated.
			s. d.	s. d.		s. d.	£ s. d	£ s. d.	s. d.
Dorset Horn cross	140	76	36 2	15 0	...	...	138 3 1	138 3 1	19 8¼
Ryeland cross . ..	140	116	32 9¼	15 0	2	30 0	192 7 8	189 7 8	27 0¾

Bathurst Experiment Farm.

As at Cowra, this experiment was continued on the same lines as last year. Here also, the aged ewes were disposed of, the price realised being 22s. per head, and 220 ewes from the same flock as those used at Cowra arrived at Bathurst early in January.

Mating commenced on 17th January, 110 ewes being mated to two Dorset Horn rams, and 110 ewes with two Ryeland rams, and continued for six weeks. The rams were removed and the two lots of ewes boxed again on 1st March.

At mating and right through till after lambing the ewes were in excellent condition. During the autumn the ewes were on stubble and fallows for about eleven hours daily, being yarded nightly, as usual, on account of the danger from town dogs. On the night of 3rd May, dogs got into the yards and killed three ewes of the Ryeland lot.

Lambing commenced on 16th June and ended on 28th July. Very cold weather was experienced during the first week lambing was in progress, and a few lambs of each lot were lost from this cause. A number of the ewes required assistance at lambing, the trouble being usually a slight disarrangement of head or legs. This may have been caused when the dogs got into the yards. The lambs were marked in two lots when they were about one month old. The particulars of lambing are shown in the following table:—

Breed of lamb.	Ewes mated.	Deaths of ewes—Parturition.	Ewes assisted	No. of lambs born.	Pairs of twins.	Deaths before marking.	No. marked	Percentage marked.
Dorset Horn cross	110	2	7	108	14	6	102	92·7
Ryeland cross	110	1	5	106	11	11	95	86·3

At this Farm a feeding experiment was carried out during the growth of the lambs, and the lambs were not weighed every month. They were weighed on 6th August and again on 3rd December, a week prior to the first draft being marketed. The average weights were as follows:—

Breed of lamb.	Average weight, 6th August.	Average weight, 3rd December.	Average increase in 119 days.
Dorset Horn cross. .	32·1 lb.	70·8 lb.	38·7 lb.
Ryeland cross	31·8 ,,	66·5 ,,	34·7 ,,

As usual, the lambs were marketed in two drafts, the first (being the 100 best lambs) were sold on 11th December, and the final draft on 22nd January, 1925. The lambs of the second draft were not in prime condition and were dry in appearance. Between marking and the time of sale two Dorset Horn cross lambs died, and when the final draft was forwarded one Dorset Horn cross lamb was unfit to send.

The prices realised at each sale were as follows:—

Breed of lamb.	First draft.		Second draft.		Combined average price.
	No.	Average price.	No.	Average price.	
		s. d.		s. d.	s. d.
Dorset Horn cross	54	38 8	45	28 5	34 0
Ryeland cross	46	37 3	49	28 7	32 9

The following table shows the net return per ewe mated:—

Breed of lamb.	Ewes mated.	Lambs sold.	Average price per lamb.	Value of lambs unsold.	Ewes died at lambing.	Value of ewes per head.	Total value of lambs.	Less value of ewes died.	Average return per ewe mated.
			s. d	s. d.		s. d.	£ s. d.	£ s. d.	£ s. d.
Dorset Horn cross	110	99	34 0	15 0	2	30 0	169 3 4	166 3 4	1 10 2¼
Ryeland cross ..	110	95	32 9	....	1	30 0	155 15 6	154 5 6	1 8 0½

Do they "Pay"?

The special facilities for visiting the departmental experiment farms and the carelessness of many farmers toward the educational opportunities offered were the subject of a paragraph in these pages recently. But there is a percentage of folk whose charge against the experiments farms is that they "don't pay." The following extracts from a publication of the Canadian Department of Agriculture are of interest in this connection:—

"What is meant by 'pay'? Surely no thoughtful man expects an experimental farm to return a cash profit each year over and above its yearly expenditure. These farms are *experimental,* not *model* farms. Many lines of experiment yield no tangible return—they simply supply information sought for; not every experiment is a success—often the result obtained therefrom is negative, *i.e.*, a certain crop or method cannot be used with success under certain conditions. Again the work of research underlying and preceding experiment. the planning of the latter, the collection and interpretation of results, the preparation and issuing of these results in the form best suited to the needs of the farmer, are large items in the cost of operating the experimental farms, items which the cash returns from the farms themselves cannot be expected to cover.

"The term 'pay' however, should be regarded as having a wider meaning. The Experimental Farms Branch is an institution of service for the Canadian farmer. To him, results obtained are transmitted through various channels for his use and benefit in his practical everyday farm operations. The sum total of this benefit, in the sense of increased production of higher quality products, is the true indication and test as to whether experimental farms 'pay' or do not 'pay'. This benefit cannot be totalled up in dollars and cents for the whole Dominion. In much of the farm's work, it is difficult to point out and name specific achievements—the work has been simply that of gradual improvement in certain farming practices and the accumulation of information to guide and stimulate better farming."

Scale of Points for Vegetable Garden Competitions.

The following scale of points for judging the growing crops (necessitating at least two judgings) was recently framed and may be of interest to branches of the Agricultural Bureau and other societies projecting similar ventures:—(*a*) General lay-out, 10 points; (*b*) continuity of supply of vegetables throughout the season, 20 points; (*c*) freedom from disease, 10 points; (*d*) freedom from weeds, 10 points; (*e*) general appearance and apparent yield, 25 points; (*f*) variety of crops, 10 points; (*g*) thoroughness of cultivation and general neatness, 15 points. Total, 100 points.—A. J. Pinn, Special Agricultural Instructor.

Trangie Experiment Farm.

HARVEST REPORT. SEASON 1924–25.

A. H. MACDOUGALL, Manager.

THE area planted with cereals during the fall of 1924 was 660 acres, exclusive of the experimental section. The seasonal conditions for the cultivation of the land and conservation of moisture in the fallows were somewhat above the average for the district. The following shows the rainfall from the time fallowing commenced up to the time the crops were fit for harvesting:—

	inches.
During fallowing period, 1st July to 15th September, 1923...	1·79
During period of bare fallow, 16th September, 1923, to 23rd April, 1924 ...	9·62
During period of germination and growth, 24th April, 1924, to 31st October, 1924	9·07
	20·48

The rainfall was very evenly distributed throughout the whole period, especially during the period the fallows were bare. This caused excessive weed growth, necessitating four cultivations between the termination of fallowing operations and the commencement of sowing.

Fallowing was commenced on 1st July, 1923, disc ploughs being used and the land turned over to a depth of an average of 4 inches, and completed on 15th September, 1923. The land was in good condition for fallowing except that it carried rather much green herbage, which it was hard to cover satisfactorily. Four springtine cultivations were given, the fallows being kept clean and in a good condition. Sowing was commenced on 24th April on a partially moist seed-bed, causing a rather patchy germination, especially noticeable in the sections sown with oats. The growth of all crops was slow until early in June, when we had a fall of 150 points, extending over five days, which greatly improved the outlook, and from that time onward the falls were sufficient and very opportune. All seed wheat sown was treated by the dry method, copper carbonate being used. The varieties sown and the yields were as follows:—

Variety.	Area sown.	Grain yield per acre.	Hay yield per acre.
	acres.	bus.	ton cwt.
Wheat—Canberra ...	223	23	2 0
Florence ...	100	16	......
Clarendon ...	50	12	......
Gresley	25	13	1 5
Hard Federation	76	27	......
Firbank ...	60	14	1 10
Warren	30	15	1 5
Oats — Sunrise	72	...	2 0
Mulga	24	...	1 10

Remarks.

Hard Federation.—This variety yielded best; the straw was short and withstood the heavy rains and storms of November, when over 6 inches fell in a few days.

Canberra.—This variety did exceptionally well and must be regarded as the most suitable variety for this district as a dual-purpose wheat. It has been a consistent grain yielder in all seasons.

Florence.—This is also a good dual-purpose wheat for this district. The low yield this season must not be taken as a true guide, as the crop was unfortunately sown on "gilgai" land and could not be harvested, on account of the prevalence of water, until the end of December. Consequently it shelled freely, and a very conservative estimate of the loss would be 6 bushels to the acre.

Gresley.—This is a very promising variety and gave very satisfactory results. It will be further tried again this year.

Firbank.—This is the most suitable hay wheat for this district; being early it allows of the hay being stacked before harvesting operations for grain are commenced.

Clarendon and *Warren* were both disappointing, the season evidently not suiting them. They made good growth, stood up well, and had good ears, but were very deficient in grain. They appeared as if they had been frosted during the flowering stage, which, though not tipping the straw, was severe enough to affect the yield.

Sunrise Oats.—As usual this variety did very well here, and gave heavy yields for both silage and hay. It can be strongly recommended to growers for those uses.

Mulga Oats.—This variety did not do as well as Sunrise, being slightly frosted, and was also badly affected with rust.

The Financial Aspect.

The crops, financially, were a success. The following is the total of produce harvested:—2,700 bags wheat; 350 tons hay; 650 tons silage.

Corned Meat Liquid in a Fowl Yard.

A Goulburn resident with a small yard of poultry utilised the liquid in which corned meat had been boiled the previous evening to feed his fowls. Next morning thirty-one out of the thirty-six fowls were dead or dying.

There was no doubt, replied the Poultry Expert, that the corned meat water was the cause of the deaths. Any excess of salt, or even small particles of salt, coming in contact with the lining membrane of the bird's crop was likely to cause mortality among fowls or chickens.

At the same time salt is necessary in their food, and it should be used at the rate of 1 oz. to each 5 lb. of wet mash; the salt should be dissolved in the water used for mixing the mash. If dry mash is fed, only about half the quantity is advisable. This should be finely powdered and thoroughly mixed through the ingredients of the mash.

The Use of Gypsum for Soil Improvement.

THE SOURCES OF SUPPLY.

A. A. RAMSAY, Chemist.

GYPSUM is a naturally occurring lime compound, forming rock masses or deposits consisting of more or less pure sulphate of lime. Unlike other forms of lime, it has no action in sweetening sour soils, but it is of great value in lands which are charged with alkali or irrigated by alkaline water. Its action consists in neutralising the carbonate of soda, which renders the soil or water alkaline or caustic, and converting it into sulphate of soda—a salt which, not being caustic, has not the same injurious effect on the soil or the crops as the original alkali had.

The ameliorative effect of gypsum on the physical condition of certain New South Wales soils of this type is interestingly discussed by Mr. A. N. Shepherd in the second portion of this article.

Gypsum, either in a raw or calcined condition, is used in many industries. The following are among the most important of its uses :—

(*a*) As a fertiliser.
(*b*) As a flux in smelting (particularly for nickel ores).
(*c*) In paint manufacture.
(*d*) As a filler in cotton and paper manufacture.
(*e*) As a possible source of sulphur in the manufacture of sulphuric acid.
(*f*) In the manufacture of Portland cement, small quantities of gypsum varying from 1½ to 3 per cent. being added to retard setting.
(*g*) In the manufacture of plaster of Paris.

Probably some 400 tons per annum are used for application to the soil as fertilisers in New South Wales, the bulk of this in the Irrigation areas, and it is anticipated that the demand will increase. Possibly 1,000 tons per annum might be given as a conservative estimate.

Numerous deposits of earthy gypsum associated with travertine (a variety of limestone) occur in the Western and South-Western Plains, but their remoteness, their varying composition, and the lack of transportation facilities have operated against any great interest being taken in these deposits commercially. The deposits which have appeared to offer reasonable prospects of successful and economic working are the Dolitty Swamp deposits and the Trida-Ivanhoe deposits.

The Dolitty Swamp deposit is situated 30 miles from Griffith in the Murrumbidgee Irrigation Area and is located about 5 miles from the nearest railway siding. It is of variable composition. Of thirty samples submitted

for examination, the content of crystallised calcium sulphate ranged from nil to 77·4 per cent., and the inert matter ranged from 98·3 to 7 per cent. Later samples showed 61·8 and 76·5 per cent. gypsum ($CaSO_4 2H_2O$).

It is understood that 1,000 to 2,000 tons would probably represent the amount of the better class of gypsum, and the deposit has only special interest to the settlers on the Irrigation Area.

The Trida–Ivanhoe deposits are located about 15 miles from Trida, which is the terminus of the Condobolin–Trida railway.

The following figures refer to the chemical composition of these deposits :—

	Range of Amounts Present.		Average of thirteen Samples
	per cent.	per cent.	per cent.
Crystallised calcium sulphate (gypsum)	79·40 (Tiarie)	to 98·38 (Umalee) ..	85·75
Calcium carbonate	Nil.	to 8·57 ...	1·91
Gangue	1·62	to 17·32 ...	8·18

The limited amount of developmental work so far carried out does not permit of a statement as to the amount of gypsum available at these various deposits. The amount in the deposit now being mined is about 6,000 tons.

Under existing conditions, gypsum mined in the locality has to be carted into Trida and forwarded to the Irrigation Area by rail *via* Parkes and Cootamundra to Leeton, a distance of about 425 miles. This long haulage is actually 62 miles more than would be the haulage from Melbourne to Leeton (363 miles).

The distance between Trida and Hillston (the terminus of the Yanco-Griffith–Hillston line) is about 35 miles, and between Roto and Hillston is 27 miles. The distance from Hillston to Griffith is 67 miles and to Leeton 97 miles. If it were possible to transport the mined product from Trida to Hillston, the haulage would be 102 miles to Griffith or 132 miles to Leeton, and a saving in railway haulage of 300 miles would be effected.

The composition of this gypsum as mined is apparently variable, and some disappointment has been met with regard to certain parcels placed on the Sydney market.

No deposit of gypsum occurring in this State is comparable as to quantity and quality with the South Australian deposits. It is from these that the raw material is obtained for the plaster of Paris now being manufactured at Auburn, New South Wales.

Following are some figures relative to gypsum production generally :—

Gypsum Production in Different Countries of the World.

	tons.
United States	2,447,611
France	1,726,379
Canada	577,442
England	242,341
Germany	108,891
Algeria	50,413
India	25,362

Gypsum Production in Australia (Commonwealth Year Book, No. 16, 1923.)

	tons.
New South Wales (from Hillston district)	300
Victoria	11,139
Queensland	......
South Australia	34,383
West Australia	664
Tasmania	......
Northern Territory	......
Total	46,486

Imports to New South Wales from Overseas (N.S.W. Statistical Register)

	tons.
Plaster of Paris from United Kingdom...	260·3
,, ,, ,, Canada	81·2
,, ,, ,, United States ...	693·95
,, ,, ,, Other countries ...	39·25
Total ...	1,074·70
Gypsum from United Kingdom	13·8

Exports (Overseas) (N.S.W. Statistical Register.)

	tons.
Plaster of Paris (Australian production) exported to New Zealand ...	709
,, ,, ,, ,, ,, Other countries ...	Nil.
Total ...	709

Experience on Yanco Irrigation Area.

A. N. SHEPHERD, H.D.A., Senior Agricultural Instructor.

The use of gypsum on the Irrigation Area has greatly increased in recent years, settlers on the heavy soils especially realising the benefits to be obtained from its use. Soil improvement experiments using gypsum and lime at various rates of application, and also applications in conjunction with green manuring, have been conducted at Leeton over the last three years, the scheme of the experiments being as follows:—

		1922. ton.	1923. ton.	1924. ton.	1925. ton.
Limed Plots ...	No. 1	½	½	½	½
	No. 2	1	Nil.	1	Nil.
	No. 3	1½	Nil.	Nil.	1½
Gypsum Plots ...	No. 4	½	½	½	½
	No. 5	1	Nil.	1	Nil.
Green Manure Plots.	No. 6	Green manure and lime, ½ ton per acre each year.			
	No. 7	Green manure and gypsum, ½ ton per acre each year.			
	No. 8	Green manure each year.			

Three check plots, one at each end and one in the middle, were included.

For this trial two plots of land planted with fruit trees were selected on the farms of Mr. J. Roberts and Mr. J. Gill. In both cases, and especially in the first, the land was very stiff and hard to work. The surface soil was very shallow, overlying a heavy, practically impervious red clay. The land literally defied permeation by water to any depth, water applied lying on the surface after irrigation for some days, while almost immediately the land was dry

enough to carry horses, it became so hard that cultivation was almost impracticable and if delayed a day impossible. Many settlers have found it necessary, in order to get sufficient water into the soil for the requirements of their trees when the fruit is nearing maturity, to run a heavy plough with the mouldboards off between the rows of trees to a depth of 12 to 14 inches. The trees benefit greatly by the extra water the land takes up.

It has now been found that after the use of gypsum on the land the soil takes up more water. This can be proved by the time taken in irrigating the various rows. On Mr. Gill's farm the water is controlled by small openings in concrete blocks, and it is found if all these openings are set to admit the same quantity of water, the water moves much faster over the untreated than over the treated areas, owing to more water being absorbed by the latter and the soaking being to a greater depth.

After irrigation is completed it is found that the treated plots are ready for cultivation, and will carry the teams one or often two days before the untreated plots, and the soil works up in much better condition, being more friable and mellow. This earlier working of the soil must necessarily mean a much better water content. The same applies after a fall of rain. In fact, instances have been noted where, before the addition of gypsum, the water lay on the surface of the soil for some considerable time after a fall of rain, whereas after giving the land a dressing of gypsum the water disappeared much more rapidly.

On examination of the experiment plots on Mr. Gill's farm on 1st August, 1924, it was noted when the holes were dry in the various sections, that the section treated with gypsum showed an appreciable effect to a depth of 18 inches, and the section treated with lime to a depth of 12 inches. In each of the untreated sections the soil was hard and dry, while in the dressed portions it was mellow and friable, and crumbled at once to a depth of 18 inches. The subsoil, too, in the dressed sections carried plenty of moisture.

Generally speaking, it is usual to apply gypsum in the winter, but in this district, where irrigation is practised, it may be applied at any time, though winter appeals most to the settlers as there is usually more time at this period of the year for carrying out the operation. It is advisable to apply the gypsum on the surface, and if the soil should be very dry to give a light harrowing.

The ordinary wheat drill with a fertiliser attachment is not very satisfactory for the application of gypsum, as the substance is not of a free-running nature. The use of a shovel is usually resorted to, and one quickly gauges the rate of spreading. Special machines for the distribution of lime give satisfactory results when gypsum is used. It has been found that spreading on the surface gives better results than ploughing under.

The result of a dressing of gypsum is readily seen. In the course of a few days its effect is visible on the surface of the soil. What before the dressing was hard and unyielding now becomes much looser, more friable, and much more easily worked.

Besides being costly, heavy dressings do not appear to be necessary, for lighter applications have so far given equally beneficial results. In both cases if further dressings are given the results will be greater. On the heaviest lands a dressing of 1 ton of gypsum should be given per acre, followed up by applications of half a ton annually. Even when only the half-ton has been given the first year, satisfactory results have been obtained.

A word of warning may not be amiss here. A farmer should not allow himself to spoil his land first by injudicious waterings, by the use of too much water, by lack of cultivation, or by permitting stock on the land while it is wet. To resort then to the use of gypsum to remedy matters is to court disappointment. Careful farming right from the start is necessary, and the gypsum must be used not as a "cure-all," but in conjunction with green manuring and good and thorough cultivation. The settler must understand that the use of gypsum is not going to take the place of good cultivation. Its function is to assist in such operations and make the working of the land more productive and less costly as to the amount of working and watering necessary, and the saving of labour and horse flesh expended.

Although gypsum undoubtedly improves soils in this district and adds to the ease with which they can be worked, the importance of green manuring should not be lost sight of. In the growing of green manure crops liberal dressings of artificial fertiliser should be applied. This enables the growth of heavier crops, encourages quicker growth, and later actually provides plant-food to trees or other crops.

The growth of trefoil was very prolific during the late winter on the gypsum and lime treated portions of the various experiments, and this in itself gave a fair crop of green manure.

Onion Growing on the Tablelands.

The greatest drawback to the spring sowing of onions in tableland districts is that the crop is not ready to harvest until autumn, at which time it is difficult to dry the onions properly on account of the frequency of dews. Unless proper drying can be effected before storing the bulbs will not keep, and will begin to shoot almost immediately. With autumn planting much depends on the soil, as on some types the freezing and thawing in winter may cause the plants to be lifted from the soil. This frequently happens on some of the black soils in New England.

Victoria is the main onion-growing State in the Commonwealth, but supplies do not come forward until fairly late in the season. It is therefore advisable for the present for local growers to raise their crop so as to come on the market before the new season Victorian crop is available in quantity. For autumn planting many of the earlier varieties, such as the Early Globes and Hunter River Early Brown Spanish, can be recommended.

On the tablelands, therefore, the main sowing should be made in April and May, and a smaller sowing only in August.—A. J. Pinn, Special Agricultural Instructor.

Condobolin Experiment Farm.

WHEAT VARIETY TRIAL FOR GRAIN, 1924.

F. MATTHEWS, H.D.A., Experimentalist.

A TRIAL was commenced on the above farm during the 1924 season to ascertain the most suitable grain varieties for the district. Owing to the most unusual weather conditions prevailing during the growing period (a dry autumn and a prolonged wet spring) all the Federation wheats, with the exception of the earliest selection, Binya, yielded exceptionally well compared with the standard early wheat for the district, Firbank.

It was noticeable that all the early wheats—Clarendon, Firbank, Florence, Sunset, Binya, and, to a lesser degree, Gresley—were more or less affected by the foot-rot organism, *Helminthosporium sativum*. The experimental plots, which are situated on rather heavy soil, appeared to be less affected by this disease than the bulk of the farm crop, which was grown on land of a much lighter nature.

Flag smut was also rather prevalent in the Binya, Canberra, and Riverina plots. Heavy rain at time of harvesting resulted in varieties such as Bald Early, Newman's Early, Gresley, and Clarendon lodging to a certain extent.

The land had been sown with wheat in 1922; fallowed with the disc plough to a depth of 5 inches in August, 1923; springtoothed in January, 1924; and cultivated with a disc cultivator to a depth of 2½ inches in February.

The rainfall on the fallow was 735 points, that on the growing crop 949 points. An additional 2 inches fell after the plots were ready to strip, but this is not included in the rainfall on the growing crop.

The plots were sown on 11th April, in triplicate, in areas of one-thirtieth of an acre, seed being applied at the rate of 66 lb., and superphosphate at the rate of 75 lb. per acre. The Canberra, Gresley, Billy Hughes, Ghurka, Hard Federation, and Firbank seed was ungraded. Pickling was carried out with dry copper carbonate.

A good germination resulted after light showers in April, but little growth was made until June, May being a very dry month. A succession of severe frosts in June and July checked the growth of Sunset, Firbank, Florence, Clarendon, and Binya. Harvesting was carried out on 8th and 9th of November.

Variety.	Average of three plots. bus.	lb.	Variety.	Average of three plots bus.	lb.
Indian F x Federation...	32	0	Riverina ...	24	0
Union ...	29	0	Clarendon ...	23	54
Indian E x Telford	28	18	Florence ...	23	0
Hard Federation	27	30	Newman's Early	22	36
Billy Hughes ...	27	18	Bald Early...	21	10
Gresley ...	26	36	Binya ...	20	18
Canberra ...	26	10	Firbank ...	18	36
Waratah ...	25	0	Sunset ...	13	10
Ghurka ...	24	18			

Notes on some Newer Varieties.

Indian F x Federation.—This is a promising variety, which matures a few days later than Hard Federation; upright growth, heads medium size; grain in weak flour class; translucent. Stood dry conditions in early part of growing season; good stooler.

Union.—A Federation cross made at Cowra about same season as Hard Federation; medium to weak flour wheat.

Indian E x Telford.—Victorian cross, slightly club-headed; chaff white, short upright growth, about the same season as Firbank; grain opaque, weak flour.

Waratah.—This is a Purple Straw x Gluyas cross. It heads later than Canberra, and it is doubtful if this wheat will yield well in a normal year, as it hardly matures quickly enough. Heads partly bearded, grain large and translucent.

Binya.—Early selection from Hard Federation. This variety, being an early maturer, should show to more advantage in a drier year.

Bald Early.—A selection from Improved Steinwedel, about the same season as Canberra; fair dual-purpose variety. Straw stronger than Improved Steinwedel; grain opaque and not inclined to shell.

The Hardest Worker on the Farm.

Cows are in reality the hardest worked animals on the farm. A horse at hard labour is not using more energy than a dairy cow does when she is producing an average flow of milk for a good cow. Horses on the farm work only six days in the week, and cost accounting records show that they work only three and one-third hours a day, on the average, for the 313 working days in the year; while good dairy cows work continuously, Sundays and holidays included, and for 320 days out of the 365 each year. Yet because she spends most of her time standing around or lying down, we think she is idle if not lazy, and do not realise the great need of saving all her energy possible to put into milk production.

In twenty herds observed on 21st June, there were 576 cows standing and only seventeen lying down, and twelve of these were in one herd on good pasture. In the thirty-four herds observed an 26th and 27th June, there were 658 cows standing and only nine lying down.

The fact that cows are on their feet and walking a great deal of the day while on grass pasture is not often considered by dairymen, but this must surely have a detrimental effect on the flow of milk.—*Hoards Dairyman.*

Inquiry for Popcorn.

The Department has had an inquiry for popcorn lately, and any grower who has some on hand can be put in touch with a possible buyer on application. Present indications are that the quantity being grown this season is not large.—H. Wenholz, Special Agricultural Instructor.

Impure Sudan Grass and its Effects on Live Stock.

YOUNG SORGHUM AND SORGHUM–SUDAN HYBRIDS CAUSE POISONING.

J. N. WHITTET, H.D.A., Agrostologist.

A FEW weeks ago a report was published in the city press that cattle had been poisoned by eating Sudan grass at Wellington. As Sudan grass is a decidedly useful fodder that is increasing in favour with owners of cattle in all parts of the State, the matter was investigated at once, and it was found that in both instances in which poisoning was reported to have occurred young sorghum and Sudan-sorghum hybrids were very plentiful, and as the young growth of both kinds is very poisonous there could be no doubt that they were the cause of the deaths.

A number of these plants were collected and submitted to the Chemist of the Department for analysis, and in every case he found present in large quantities the glucocide that, on decomposition, produces prussic acid.

Fig. 1.—Mr. S. J. Matthews' Sudan Grass Crop at Wellington.
Note the broad leaves and coarse stems of hybrid plants in the foreground.

For some years past warnings have been addressed by the Department to farmers against sowing impure Sudan grass seed, and not only have seedsmen been prosecuted under the Agricultural Seeds Act for selling seed of that class, but farmers have been asked to send in samples of seed for examination prior to sowing.

The co-operation of all farmers and seedsmen is sought by the Department in clearing up the areas of impure seed, and without that co-operation isolated cases such as those which occurred at Wellington are certain to continue.

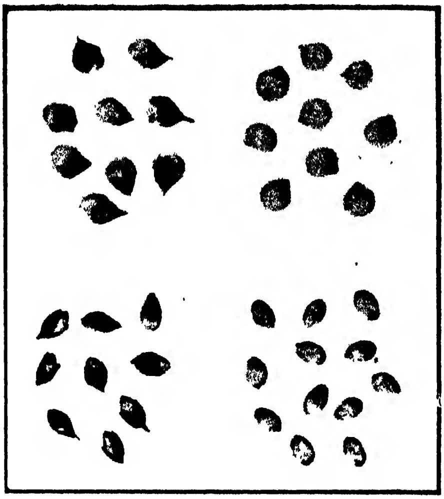

Fig. 2.—Upper Pair—Milo Grain Sorghum Seed.

On the left, unshelled; on the right shelled.

Lower pair—Planter's Friend Sweet Sorghum Seed.

On the left, unshelled, on the right shelled.

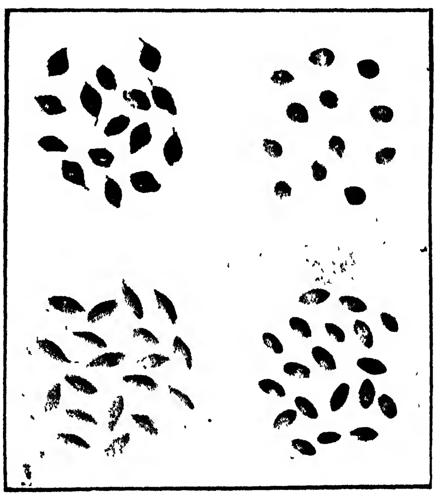

Fig. 3.—Upper Pair—Sorghum-Sudan Hybrid Seed.

On the left, unshelled, on the right, shelled.

Lower Pair—Sudan Grass Seed.

On the left, unshelled; on the right, shelled.

Note that the Sudan grass seeds are elongated and flat, and inclined to be pointed at the ends.

Fig. 4.—A head of Sudan Grass compared with heads of Sorghum and Sorghum-hybrids.
On the Left—Sudan Grass, *in the Centre*—Seven heads of hybrid plants; *on the Right*—Sorghum.

The seed from which the above heads were raised was from a consignment that attracted the attention of the Department. Distribution of this seed was prohibited, owing to the danger of stock being poisoned by the resultant crop.

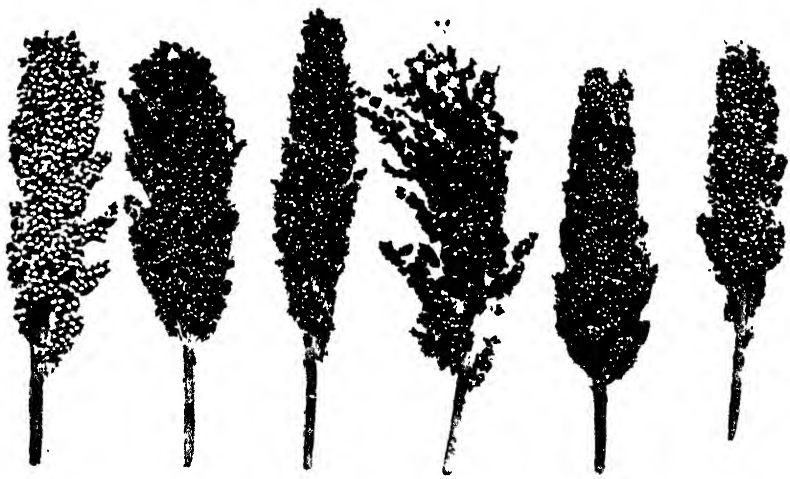

Fig. 5.—More Sorghum Types.

These heads are from imported Sudan grass seed that, when planted out, proved to be impure.

All growers of Sudan grass should make certain that their seed is pure. The Department is doing its utmost to supply the demand for pure seed, and growers should be content to purchase enough for 1 or 2 acres to begin with (6 to 8 lb. of seed are sufficient to sow an acre), and from that they should work up a stock of seed for sowing larger areas and also for sale purposes. As sorghum cross-fertilises very readily with Sudan grass, pure seed areas should not be in close proximity to a paddock of sorghum, because if the two crops are flowering at the same time, hybrid plants, which are poisonous in their young growth, will result from the seed of this cross.

The Deadly Effects of the Poison.

As showing what deadly effects these young sorghum and Sudan sorghum hybrid plants have on milking cows, Mr. S. J. Matthews turned ten cows on to young growth at Wellington, and within ten minutes seven were affected. Their muscles became rigid, and five of the animals went down, and two of them died.

Fig. 6.—A Sorghum Plant in Mr. J. Zaia's Crop of Sudan Grass.

Mr. Matthews had grazed Sudan grass in previous years, and no ill effects had resulted. When the sorghum and hybrid plants were pointed out to him, he stated that he had not noticed them in previous years.

Mr. James Zaia, in order to save his crop from grasshoppers, also turned his cows on to young growth, and within ten minutes seven cows out of eleven were affected. He lost three cows out of the seven. More sorghum plants were present in this area than in Mr. Matthews' crop.

How Farmers may Identify Undesirable Plants.

Sudan grass has a very open head, fine stems, and narrow leaves. Most varieties of sorghum have compact heads (with the exception of varieties such as Early Amber Cane and Honey), coarse, thick stems, and broad leaves.

The hybrid plants vary considerably in size and appearance, but in their young stages of growth generally stool very freely, their stems being much coarser and leaves broader than Sudan.

Sorghum and Sudan-sorghum hybrid seeds are more or less rounded in shape, whereas Sudan seed is flatter, more elongated, and somewhat pointed at ends.

Balanced Rations for Feeding Dairy Cows.

The food of the cow must be ready made and composed of such materials and in such proportions as will maintain body temperature, provide for milk production, and make good the waste of tissue that is constantly going on. The nutritive portion of the food may be divided into three parts—protein, carbohydrates, and fat. A well-balanced daily ration for a cow in milk weighing 1,000 lb. without any additional food in the way of grass should contain 24 lb. of dry matter, 2·5 lb. of protein, 12·5 lb. of carbohydrates, and ·5 lb. of fat.

A ration composed of these will give a nutritive ratio of 1 : 5·4 or 1 lb. of digestible nitrogenous matter to 5·4 lb. of carbohydrate matter. A productive ration, to produce meat, milk and other products, ranges from 1 : 4 to 1 : 7. A maintenance ration simply to keep an animal alive ranges from 1 : 12 to 1 : 15.

The following daily rations will be found suitable for cows in milk :—

		Dry Matter.	Protein.	Carbo-hydrates.	Fats.	Nutritive Ratio.
1.	15 lb. lucerne hay	13·24	1·14	5·67	·195	...
	5 lb. wheaten chaff ...	4·10	·18	2·30	·055	...
	6 lb. bran	5·28	·75	2·64	·17	...
	2 lb. corn meal	1·72	·14	1·32	·07	...
	Totals...	24·34	2·21	11·93	·490	1 : 5·9
2.	40 lb. silage	10·0	·52	5·4	·24	...
	8 lb. lucerne hay	7·12	·99	2·97	·12	...
	2 lb. linseed meal ...	1·78	·52	·77	·13	...
	Totals...	18·90	2·03	9·14	·49	1 : 5
3.	40 lb. silage	10·0	·52	5·4	·24	...
	10 lb. lucerne hay	8·9	1·23	3·71	·16	...
	8 lb. bran	7·06	·9	3·38	·2	...
	Totals...	25·96	2·65	12·49	·60	1 . 5·2

A maintenance ration for cows not in calf could consist of 40 lb. silage. This would give a nutritive ratio of 1 : 11·4. Where plenty of grass is available a corresponding reduction may be made in the rations of a cow.

No matter how carefully a ration may be prepared cows will not all respond to it alike. Much depends upon their digestive powers, individuality, breed, capacity for producing milk, and the climate will also have a big influence.

Heavy milkers require a ration containing a larger proportion of digestible albumenoids than cows yielding small quantities of milk.—F. Wilkinson, Senior Dairy Instructor.

Farmers' Experiment Plots.

POTATO TRIALS, 1924.

Upper North Coast.

W. R. WATKINS, H.D.A., Agricultural Instructor.

TRIALS with potatoes were carried out in co-operation with the following farmers :—

T. Hannah, junior, "Carra Lynn," Lawrence, Clarence River.
F. L. Playford, "Merrylands," Nana Glen, Orara River.
H. Johnson, Condong, Tweed River.
M. McBaron, "Riverview," Raleigh, Bellinger River.
C. Oliver, "Laureldale," Casino.
H. Short, "Warrawee," Dorrigo.

The Season.

A change in conditions from the last few seasons resulted in some good crops being grown on the North Coast. Land that had been winter-ploughed had the benefit of good rains which fell during June and July, and most of the farmers took the advantage of this and made early plantings. The season commenced well, and, with the exception of a few parts, continued favourable throughout the growing period, some good yields being obtained.

Owing to the excessive rain after planting and dull cloudy weather, Irish blight made its appearance and ruined the Dorrigo plots. Spraying could not be carried out owing to the showery weather, which lasted for weeks. The early planted crops had practically matured before the blight made its apearance, but the later crops were a failure.

Comparable results were not obtained from the Casino plots owing to excessive rains at planting, which caused a great number of the "sets" to rot.

The Plots.

Lawrence.—Soil, alluvial loam; previous crop, early maize with cowpeas between rows. The land was ploughed in May, again in August, then harrowed, rolled, and harrowed. Planting was carried out on 15th August, n drills 3 feet apart, 12 inches between sets, and 4 inches deep. Sets were covered with the plough and land rolled. Soil was in excellent order and germination was good throughout. Plots were light harrowed 25th August, and again on 17th September, scuffled 26th September, hilled 6th October, and dug on 6th December. The variety trial was manured with superphosphate at the rate of 2½ cwt. per acre.

Factor gave the best yield, the crop making good growth and the manured plots were all flowering much earlier than the unmanured. The benefits and increase in yield through ploughing under a green manure crop of cowpeas was proved beyond doubt on these plots, higher yields being obtained this season than for many years.

Nana Glen.—Soil, light reddish brown clay loam; previous crop, maize. Land was ploughed and harrowed in July and again in August, and rolled before planting. Planting was carried out on 22nd August in drills 2 feet 9 inches apart, 12 inches between sets, and 4 inches deep; harrowed and crossed after planting. Soil was in good order and germination was good in the varieties, but only fair in the Manhattans. Plots were lightly harrowed when plants were just showing; scuffled 24th September, hilled 4th October, and scuffled 20th October. The variety trial was manured with superphosphate at the rate of 2½ cwt. per acre.

The Manhattans made very slow growth and were not dug till 22nd December, while the other varieties were dug on 28th November. The variety trial was manured with superphosphate at the rate of 2½ cwt. per acre.

Condong.—Soil, alluvial loam; previous crop, wheat and oats for green feed. Land was ploughed 1st July, harrowed, ploughed 22nd August, and harrowed. Planting was carried out on 26th August in drills 3 feet apart, 12 inches between sets, and 4 inches deep; covered with plough, then harrowed and crossed. Soil in good order and germination good. Plots were scuffled twice and hilled early in November. Dug 23rd December.

Wheat and oats being very heavy feeding crops the previous crop on the area had its effect on the potato yields. The variety trial was manured with superphosphate at the rate of 2½ cwt. per acre.

Raleigh.—Soil, alluvial loam; previous crop, maize for green feed. Land was ploughed in June, disc-harrowed twice, ploughed again 13th August, disc-harrowed and harrowed. Planting was carried out 20th August in drills 2 feet 9 inches apart, 12 inches between sets, and 4 inches deep. Covered by harrowing. Germination was patchy owing to some sets being displaced by harrow. Plots were scuffled twice and hilled in October. The variety trial was manured with superphosphate at the rate of 2½ cwt. per acre. Dug 20th January.

Comments.

Three new white varieties were included in the trials this season—namely, Gold Coin, Irish Cobbler, and Great Scot—all being early maturing varieties, especially Irish Cobbler, which in all trials was ready for digging two to three weeks ahead of Factor, Manhattan, Manistee, or Satisfaction. The haulms are very short and small, light green, and the tubers are clustered, making digging easy.

Gold Coin and Great Scot were later maturing than Irish Cobbler, but earlier than the other varieties. Although it is hard to remark on the suitability of these potatoes, as they have only been tried on the North Coast for the first time, the one that made the best showing was Gold Coin. The percentage of unmarketable tubers was high with the other two varieties, but the marketable tubers produced by all three varieties, although not large, were even in shape and size.

Neither Satisfaction nor Early Manistee yielded as well in comparison as in previous years, but this may have been due to the seed, the Satisfaction being exceptionally large, while many of the Early Manistee had started to rot in the bags. Manhattan and Factor gave the best results, both for percentage of marketable tubers and for yield. The Manhattan at Raleigh showed a little second growth, but the rest of the trials were free.

RAINFALL during Growing Period.

Month.	Lawrence.	Condong.	Nana Glen.	Raleigh.
August	125	72	60	230
September	129	245	131	102
October	245	319	207	198
November...	396	469	341	468
December	54	260	225	699
Total	949	1,365	964	1,697

RESULTS of Variety Trials.

Variety.	Lawrence.	Condong.	Nana Glen.	Raleigh.
	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.
Early Manhattan	6 16 3 11	....	7 12 0 13	6 4 3 6
Factor	8 2 0 7	4 2 2 0	8 3 1 11	6 18 0 24
Satisfaction	5 6 2 11	3 6 3 4	4 19 1 19	5 6 2 5
Early Manistee	5 1 2 6	2 15 0 0	5 4 2 9	4 13 1 14
Gold Coin	4 5 0 0	3 0 3 16	5 11 2 0	4 15 0 0
Irish Cobbler	3 14 0 0	3 16 2 12	4 0 1 14	4 1 0 3
Great Scot	5 12 1 13	3 16 2 12	5 5 1 22	6 2 7 21

Each of the above varieties was manured with superphosphate at the rate of 2½ cwt. per acre.

The Fertiliser Trials.

In practically every instance where trials with fertilisers have been carried out, not only with potatoes, but with all crops, the results have shown a decided increase due to the use of fertiliser. While increased yields are thus obtained, it must be remembered that this class of manure does not supply humus to the soil, nor does it "build a soil up," and so we look to a green manure crop to do this. In districts as the North Coast, where intense culture is carried out and the same crops are grown continuously on the same land, the ploughing under of a green manure crop is not only beneficial but becomes a necessity if the fertility of the soil is to be maintained. The common practice in this district is to follow maize with potatoes year after year, and consequently the yields of both crops gradually decrease, owing to the humus content of the soil becoming depleted. Soil, no matter how rich, does not contain an everlasting or inexhaustible supply of available plant food, and n rich soil the aim should be to maintain the fertility and in poorer land

to build up the soil. To do this in the most economical and successful way grow crops for green manure—for preference, leguminous crops such as cowpeas, velvet beans, field peas or vetches. For North Coast conditions, cowpeas or velvet beans are most suitable, planted alone or in the maize crops.

The Clarence River farmer is beginning to realise that something has to be done along these lines, and this year almost every early crop of maize on the lower river has been planted at the last scuffling with cowpeas. Both cowpeas and velvet beans make luxuriant growth planted this way, and are ready to be ploughed under as soon as the maize is harvested. This method should lead to better crops being grown, and with the use of fertilisers the yields should be increased considerably, the green manure enabling a greater benefit to be derived from the fertilisers applied to the following crop.

RESULTS of Manurial Trials.

Fertiliser per acre.	Lawrence. Factor.	Condong. Factor	Nana Glen. E. Manhattan.	Raleigh E. Manhattan
	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.
Superphosphate at 2½ cwt. ...	8 2 0 7	4 2 2 0	7 12 0 13	6 4 3 6
,, ,, 5 ,, ...	8 2 3 3	4 12 1 8	8 2 2 2	6 10 0 2
P3 at 4 cwt.	9 2 0 26	5 2 0 6	8 18 3 11	8 18 1 22
P7 at 2½ cwt.	7 17 0 2	5 19 3 8	6 13 3 24	7 16 3 10
M13 at 3¼ cwt.	8 4 0 25	5 11 3 24	6 6 0 21	7 7 0 17
No manure	7 6 0 24	4 3 3 20	5 19 2 23	6 13 1 14

P3 consists of ten parts superphosphate, three parts sulphate of ammonia, and three parts sulphate of potash. P7 consists of equal parts of superphosphate and bonedust. M13 consists of ten parts of superphosphate and three parts sulphate of potash.

Factor was the variety used at Lawrence and Condong, and Early Manhattan at Nana Glen and Raleigh.

Murrumbidgee Irrigation Area (Griffith Centre).

E. B. FURBY, H.D.A., Agricultural Instructor.

During the season 1924 potato trials were conducted by the Department on the following farms:—

B. E. Martin, Farm 136, Hanwood.
C. Eipper, Farm 1421, Griffith.

From these plots the yields did not prove to be too satisfactory, on account of the season being very unfavourable to potatoes. Both plots were sown during the first week in September, when the weather was beginning to warm up, and a very quick strike was made. Good light showers kept the

crop moving up to the flowering period in October, when dry spells followed, culminating in a deluge of rain in November which seriously flooded both crops, setting the ground hard, and causing a certain loss by rotting the tubers. Unduly hot weather was not experienced during the latter part of the season; on the other hand, it was generally mild.

Such facts as the above would indicate to many that potato growing on these areas is beset with annual calamities which would make it unprofitable. It is not claimed that potato growing is a commercially profitable undertaking here when compared with other potato districts, but every year is not an unfavourable one for this crop, and the local demand usually offers prices that make a small plot of an acre or so on the good soils a remunerative side line.

The rainfall registrations were as follows:—September, 115 points; October, 76; November, 494; December, 120 points. Total, 405 points.

The Plots.

Farm 136 -*Variety Trial*—This plot was sown on red sandy soil, easily worked, but containing a fairly large proportion of binding clay. Earlier in the year it had grown a crop of peas, the tops of which were ploughed in in July and the ground fallowed during the intervening period to September, being harrowed twice and worked down to a very good condition for sowing. The sets, some of each variety being cut and some whole, were planted in furrows and covered by the plough. P3 fertiliser mixture was applied at the rate of 3 cwt. per acre. Only one irrigation was given, and that just prior to the rain in November. The crop was twice cultivated—once in October and again after the heavy rain.

Most of the varieties were attacked by a blight denuding many plants of their foliage, but did not appear to have any material influence on the crop.

YIELDS of Variety Trials.

Variety.	Percentage of tubers unmarketable.	Yield.
	per cent.	t. c. q. lb.
Early Manhattan	7	2 2 3 0
Great Scott	47	3 1 2 24
Irish Cobbler	16	1 18 1 25
Factor	12	1 17 1 21
Gold Coin	24	1 16 1 0
Satisfaction	20	1 15 0 5
Early Manistee	28	1 12 0 22

The outstanding variety for yield was Great Scott. This is a new variety here and a late one, and it should receive further consideration from growers. It gave a large number of tubers per plant, but a high percentage of small ones. By planting earlier this may be avoided.

Early Manhattan, a well-known and reliable variety on the areas, produced good tubers of even size with only a minimum of small ones. This is a very hardy variety for these conditions. Irish Cobbler, next in order, is a very early variety, with even sized tubers of good cooking qualities; it attracted much attention. The tops were completely devastated by the late blight.

Gold Coin, an early variety, showed promise of a good yield. The marketable tubers were of large size and even shape, the tops also being affected by late blight.

Factor was comparatively immune to the blight. The tubers were rather small compared with other varieties, though the percentage of unmarketable tubers was not unduly high. The same may be said in reference to Satisfaction, which is sought after by some growers, though it might easily be replaced by hardier and more productive varieties.

It is interesting to note that in an adjoining crop of Carmen potatoes, not included in the experiment and sown with very small whole sets, a much better crop was obtained than from the experiment plots as a whole. It is known that several bags of this variety grown in this district were stored for nine months without loss. This is a very important point, as considerable difficulty is experienced here in storing potatoes even for short periods.

Farm 1421—*Manurial Trial.*—This plot was sown on similar country to the variety trial. The previous crop was maize for grain. Only a short fallow was given, the soil not being in tip-top condition for planting, though containing ample moisture. Two irrigations were given, one in October and one in November, rain falling immediately after each watering. A cultivation after each irrigation assisted in keeping the soil in fair tilth.

As in the variety trial, much damage was done by the rain, and late blight wiped out the tops fairly early after flowering. The variety sown was Early Manhattan.

YIELDS of Manurial Trial.

Manure.	Yield.			
	t.	c.	q.	lb.
No manure	3	0	0	21
Superphosphate 2½ cwt. per acre	2	16	1	0
P3 4 cwt. per acre	4	15	2	22
M13 3¼ cwt. per acre	4	12	1	0

The composition of these mixed fertilisers is given on page 274.

The no-manure plot had a very poor growth of tops, while on P3 mixture the growth of haulms was very profuse. In all plots treated with fertiliser it was found that the tubers were particularly scabby, and would not keep too long after being dug, while where no manure was applied they were practically free from scab.

Although there is not a marked difference between the manured and unmanured plots, it is fairly apparent that manuring is a practice which fully justifies its adoption. The use of superphosphate alone does not appear to be of any material benefit.

New England District.

M. H. REYNOLDS, H.D.A., Senior Agricultural Instructor.

POTATO trials were carried out during the season 1923–24 in co-operation with the following farmers:—

E. Scott, Red Range, Glen Innes.
J. B. Howell, Red Range, Glen Innes.
J. Hill, Guyra.
E. Wilcox, Armidale.
A. D Brecht, Kentucky.

Owing to various circumstances publication of the results has been considerably delayed, and they are given without the usual comments.

RAINFALL RECORDS.

Month.	Red Range.	Armidale.	Guyra.	Kentucky.
1923.	Points.	Points.	Points.	Points.
October ...	Nil.	70	Nil.	111
November ...	97	98	207	134
December ...	275	262	576	410
1924.				
January ...	261	238	249	359
February ...	536	497	287	812
March ...	141	106	118	37
April ...	174	... ..	297	.. ...
Total ...	1,484	1,271	1,734	1,863

RESULTS of Variety Trials.

Variety.	Red Range (E. Scott).		Kentucky.		Guyra.		Armidale.	
	Yield.	Percentage Seed Potatoes.	Yield.	Percentage Seed Potatoes.	Yield.	Percentage Seed Potatoes.	Yield.	Percentage Seed Potatoes.
	t. c. q.		t. c. q.		t. c. q.		t. c. q.	
Dakota Red ...	5 9 1	14	5 14 0	22	..	..	..	..
Symington ...	8 18 0	17	6 7 0	26	7 1 2	18	5 14 3	11
Factor ...	10 3 0	23	5 19 1	31	7 12 0	20	9 5 0	19
Surprise ...	7 9 2	22	5 1 2	30	6 15 2	16	..	..
Coronation ...	9 14 0	22	4 18 3	37	7 9 2	17	..	..
Satisfaction ...	10 10 0	21	3 3 1	35	6 6 3	28	4 9 1	31
Batlow Cross ...	..	..	3 7 3	35	..	..	7 0 1	36
Parson's Seedling ...	..	..	3 8 1	28	..	..	5 2 1	25
Early Manhattan ...	9 16 0	16	..	..	6 6 2	15	7 13 0	12½
Queen of the Valley ...	..	..	..	..	6 8 1	23	.	.
Teasdale ...	..	.	..	..	8 16 2	12	8 0 2	26
Elliott's Pink Eye ...	8 12 0	22	..	..	..	..	6 1 1	37
Batlow Redsnooth ...	..	..	..	..	..	.	6 10 3	17

RESULTS of Fertiliser Trials.

Fertiliser per Acre.	Kentucky.				Red Range.				Armidale.				Guyra.			
	Yield.			Percentage Seed Potatoes.	Yield.			Percentage Seed Potatoes.	Yield.			Percentage Seed Potatoes.	Yield.			Percentage Seed Potatoes
	t.	c.	q.		t.	c.	q.		t.	c.	q.		t.	c.	q.	
*P1, 322 lb.	4	12	0	34	6	12	0	.	4	9	1	43	6	1	0	38
*P2, 322 lb.	3	18	2	31	7	2	1		4	16	0	28	5	8	0	38
*P3, 4 cwt.	4	4	2	23	6	19	0		4	9	1	25	7	4	0	24
*P10, 3½ cwt.	4	3	2	47	6	16	1	..	4	19	0	39	6	14	0	27
*M3, 3¼ cwt.	3	17	2	43	8	5	0	.	4	9	1	32	5	15	0	25
*M13, 3¼ cwt.	.				7	2	0		4	16	0	33	5	15	0	25
Superphosphate, 2½ cwt.	3	16	1	24	6	1	3		4	9	1	39	6	10	0	32
Proprietary mixture, 4 cwt.					..				.				6	16	0	33
Unmanured ..	4	2	0	25	5	2	3		4	9	1	57	7	1	1	24

* P1 mixture consists of superphosphate 10 parts and sulphate of ammonia 1½ parts; P2 of superphosphate 10 parts and sulphate of potash 1½ parts; P3 of superphosphate 10 parts, sulphate of ammonia 3 parts, and sulphate of potash 8 parts, P10 of superphosphate 10 parts, sulphate of ammonia 1½ parts and sulphate of potash 1½ parts; M3 of superphosphate 10 parts and sulphate of ammonia 3 parts; M13 of superphosphate 10 parts and sulphate of potash 3 parts.

Satisfaction was the variety used at Kentucky, Red Range (principally) and Armidale. Factor was used at Guyra.

Lower North Coast.

J. M. PITT, H.D.A., Senior Agricultural Instructor.

POTATO trials were conducted with the following farmers:—

J. G. Ward, Sherwood, Macleay River.
F. Waters, East Kempsey, Macleay River.
A. H. Longworth, Ghinni, Manning River.
J. P. Mooney, Dumaresq Island, Manning River.
A. M. Hooke, Taree Estate, Manning River.
J. G. Perrett, Miller's Forest, Hunter River.

Although good moist seed-beds were assured by the heavy July rainfall, the months following (August, September, and October, until the 29th) were very dry. Evaporation, however, was not above the ordinary owing to the absence of drying winds. September and October were somewhat unseasonable, the days being warm and the nights mostly very cold. These conditions were responsible for blight making its appearance, the trouble being very severe in parts, while paddocks adjoining, strange to relate, escaped entirely. In other instances portions of a paddock remained clean and some varieties succumbed first. The condition of the soil as to moisture, the looseness of the soil, and the situation of the plot were ruling influences.

Where the disease made its appearance in the early stages of growth the tubers remained small. Where the crop had advanced some good yields were harvested. The disease was confined to the above-ground growth entirely. Green beetles were also troublesome, especially in the Macleay district, where they have also attacked the young maize. The Irish Cobbler

plot at Mr. Ward's farm was deprived of its top growth in a few days by these insects. Although adjoining, the other varieties were not attacked until a later stage.

From 29th October rain was almost continuous for the remainder of the year, and owing to the excessive weed growth and moist conditions many fields were not dug until January. At the time of writing some still remain, but that is due chiefly to the very poor prices ruling, farmers deeming it more profitable to let the crop stay where it is.

The area sown to potatoes was by far the heaviest seen on the Lower North Coast for many years. The prospects for maize were not of the brightest, many barns being still full with the previous year's crop, and farmers found it necessary to launch out in other directions. Seed potatoes were cheap, hence the increased sowing. Unfortunately production was so heavy that the market became over-supplied and prices fell below the paying line.

The Plots.

Sherwood.—The plot was sown on a paddock that had been many years under pasture. Maize had been sown the previous year, after which the land was ploughed, harrowed, and fallowed. Early in August the land was ploughed and harrowed again. The sets were ploughed in on 29th August. Germination was good, and the crop was cultivated twice and hilled. It was in this plot that the beetles were at their worst, Irish Cobbler being eaten out five weeks after hilling. Factor usually does best in this neighbourhood, and it again yielded well. The farmer was favourably impressed with both Irish Cobbler and Great Scot, especially their early-maturing characteristics. The best results in the fertiliser plots were obtained from the M 13 and P 7 mixtures, but all of the treated plots were in advance of the no-manure plot.

East Kempsey.—This plot was sown on 27th August on a low-lying portion of rich alluvial land. The farm had been under cultivation for many years. The previous crop was maize, and the land had been ploughed early and fallowed. Furrows were opened and the sets sown and then covered with the plough, superphosphate being applied at the rate of 2 cwt. per acre over the bed. Several scufflings were given, and the crop promised well until practically wiped out by blight in October. Gold Coin and Irish Cobbler were the first to go. The bed was not dug.

Ghinni.—This plot was in a rather low-lying centre. The land had grown potatoes previously; it was ploughed twice, the first time early in the year, and in between ploughings was disc-cultivated twice and rolled. Drills were opened, and the sets sown on 26th August and covered with the plough Two cultivations were given after germination.

Blight made its appearance in October, and it was noticed that the manured section was attacked the worst, although at later periods all varieties were affected. The best yields were from Manhattan, Irish Cobbler, and Factor. The last-mentioned variety usually does best in this district.

Dumaresq Island.—This plot was of a light loamy nature, and prior to last season had been many years under pasture. The previous crops were potatoes the previous spring, followed by "cow corn." The plot was ploughed twice and double-disced twice, and was in good order for sowing on 1st September. The sets were ploughed in. Two cultivations were given after germination. About the third week in October Gold Coin was badly blighted, after which Irish Cobbler and Great Scot became affected. Manistee, Satisfaction, Manhattan, and Factor were comparatively free until November, when they too were attacked. The newer varieties showed great promise in this bed until spoilt. P 7 and M 13 were the best of the manured sections.

Taree Estate.—The soil here was rather heavy and somewhat low-lying. The previous crop was maize, and the land had been under cultivation for many years, comprising one of the oldest established farms on the Manning River. Prior to sowing on 30th August the land was ploughed once and well worked. The soil was in good tilth for the ploughing in of the sets. Germination was good, and growth continued good throughout. Cultivations were given at intervals. During October the plot was in need of rain, but excellent results followed the rains later. Factor and Manhattan were the outstanding varieties, the yields being the heaviest obtained in this neighbourhood for some years. Irish Cobbler and Gold Coin were favourably commented upon; the former for its early maturity, being quite two and a half to three weeks earlier than any of the other varieties. No blight was present in the plot. The yields here included marketable and unmarketable tubers.

Miller's Forest.—This plot was sown on a loamy piece of soil that had been under cultivation for very many years The previous crop was potatoes. After the removal of this crop the plot was ploughed and left in fallow. Two more ploughings were given prior to sowing on 30th August, when drills were opened and the sets covered with the cultivator. Germination was good, and the plot was one of the best seen in this neighbourhood for many years. The crop was comparatively clean, and the farmer was impressed with the Irish Cobbler variety, chiefly on account of its earliness, the crop being dug twelve weeks after planting. Factor, Gold Coin, and Manistle all yielded well.

RAINFALL.

	Taree.*	Kempsey.†	Sherwood.
1924.	Points.	Points.	Points.
August	184	179	122
September...	233	164	144
October	139	231	184
November	732	597	539
December	710	322	286

* For Taree Estate, Dumaresq Island, and Ghinni centres.
† For East Kempsey.

RESULTS of Variety Trials.

Varieties.	Sherwood.	Ghinni.	Dumaresq Island.	Taree Estate.	Miller's Forest.
	t. c. q.	t. c. q.	t. c. q.	t. c. q.	t. c. q.
Irish Cobbler ...	6 4 0	4 17 0	3 18 0	8 2 0	4 16 1
Early Manhattan	7 17 0	4 18 0	4 12 0	15 0 0	7 12 3
Early Manistee ...	......	3 1 0	5 0 3	7 17 0	7 17 0
Satisfaction ...	7 17 0	3 12 0	4 2 0	10 10 0	7 9 1
Factor	7 7 1	4 16 0	3 17 0	13 3 0	8 16 3
Great Scot ...	7 5 0	......	5 7 1	......	5 6 0
Gold Coin ...	......	......	Not weighed	10 5 0	7 19 0

RESULTS of Fertiliser Trials.

Fertiliser per acre.	Sherwood.	Dumaresq Island.
	t. c. q.	t. c. q.
No manure	7 7 1	3 17 0
*M 13, 3½ cwt.	8 13 2	5 7 1
*P 3, 3½ cwt.	7 17 3	3 8 2
*P 7, 2½ cwt.	7 16 2	5 11 2
Superphosphate, 2½ cwt. ...	8 4 2	5 0 2

The plots in the fertiliser trial at Ghinni were too uneven for weighing.

* M 13 consists of 10 parts superphosphate and 3 parts sulphate of potash; P 3 of 10 parts superphosphate, 3 parts sulphate of ammonia and 3 parts sulphate of potash; P 7 of equal parts superphosphate and bonedust.

FIELD TRIALS THE FINAL GUIDE.

MANY farmers are under the impression that it is possible for the expert to take a matchboxful of their soil and characterise it as a good, bad, or indifferent growing medium for crops in general, or some particular crop, sim ply by determining the percentages of plant-food ingredients apparently present, and that solely on the strength of such a determination he could prescribe a fertiliser formula that would repair all the defects. For such a purpose, on the contrary, mere chemical analysis of the soil is of little use. It has been found that the only sure method of ascertaining the fertiliser requirements of a soil is by actual trial on the land itself.

Although a chemical analysis of a soil may state the total amount of plant-food present, it does not indicate the amount available to the growing crop. Other factors, such as location, mechanical condition of the soil, bacterial life, etc., also play their part in determining the suitability of soils for various crops.

Soil analysis is therefore only carried out by the Department under special circumstances, and then only on the recommendation of the agricultural instructor for the district.

DEPARTMENTAL INFORMATION BY WIRELESS.

THROUGH the courtesy of Messrs. Farmer & Co. Ltd., Sydney, the Minister for Agriculture has arranged to have information broadcasted each month regarding the condition of the stock routes throughout the State.

Mr. Chaffey considers that such information should prove a boon to stock-owners and those dealing in stock in the various parts of the State.

Weeds Common in New South Wales.

Common Heliotrope (*Heliotropium europæum.*)

E. CHEEL and R. H. ANDERSON.

This is a very common weed, chiefly found in cultivated ground and waste places in settled districts. The specific name indicates that this species is of European origin. It is generally regarded as a native of the Mediterranean region, but it is also found in Asia, and is given as a native of Australia by the early botanists. It is now established in many parts of the State. It is a branching annual, with rather stiff down, the oval leaves a greyish green on both sides. Flowers small, creamy-white, arranged in from one to four spikes.

It is a very difficult weed to eradicate when once established, as it seeds very freely. The only way to keep it in check is to destroy the young plants before they run to seed. All plants past the flowering stage should be handled carefully so as to prevent the seed from being scattered, and should be burned. Although its properties have not been determined, it is not regarded as being in any way harmful to stock. The plant when dry has a most unpleasant odour, resembling that of mice.

An illustration of this weed appears on the opposite page.

Group Organisation in Agriculture.

The year 1924 will, no doubt, be remembered as a good one. A heavy clip of wool has been produced and a bountiful wheat crop is now being garnered, with satisfactory prices ruling for these and most primary products. But have we done anything to help in this direction? Might we not as easily have been faced with the problem of good returns and poor prices?

The producers have always left the marketing side of their business to chance. It has been a case of "Go your hardest, produce what you can, and trust to luck as to whether it can be sold at remunerative prices." Is it not time we gave the marketing problem very serious thought? I would suggest that the subject be given first place on our programme for the coming year. With the exception of agriculture, practically all commerce and industry is organised on a group capital, group production, and group distribution basis. We may find it difficult or even impracticable to attain to the same high degree of efficient organisation as that enjoyed by some of the other industries, but there is no reason why with more comprehensive organisation and co-operative effort we should not be able to control agriculture in nearly the same way as manufacturers control manufactures. I feel sure the realisation of this can and will be brought about by the various means of co-operative activity provided for under the Co-operation, Community Settlement, and Credit Act.—W. E. Tayler, Chairman, Advisory Council, in a recent issue of *Agricultural Bureau Record.*

Common Heliotrope (*Heliotropium europæum*.

A.—Portion of a plant.
B.—A solitary flower.
C.—A flower opened to show the stamens.
D.—Ovary and style.
E.—Fruit enclosed in calyx lobes.
F.—Mature fruit with one carpel removed.
G.—A solitary carpel.

The Cleaning of Milking Machines.

An article in the New Zealand *Journal of Agriculture* advocates a method of cleaning milking machines which does away with the scrapers and spiral hair-brushes that so damage the inner surfaces of the rubbers.

The following are essential to the method :—(1) A suitable plant for boiling water; (2) a stock of caustic soda; (3) an ample supply of clean water; (4) some scrubbing-brushes, large buckets, a suitable bath or tub, and a ball of horsehair.

The procedure recommended is as follows :—

(1) Before milking draw cold water through all milk tubes and the releaser, so as to prevent the adhesion of milk to the pipes, &c.

(2) Immediately after milking wash all dirt off the outside of the teat-cups and rubbers; then draw through each set of teat cups sufficient cold (or preferably lukewarm) water to flush out the milk system. When drawing the water through the set farthest from the releaser insert a ball of horsehair in the end of the milk-pipe, to cause it to travel through to the releaser with the water.

(3) Next draw through each set of teat-cups not less than 1 gallon of boiling water to which caustic soda has been added at the rate of not less than one to 1½ tablespoons per 4 gallons of boiling water. Distribute the solution as evenly as possible through each set of teat-cups.

(4) Immediately follow by flushing out the caustic soda solution with 2 gallons of hot water or one gallon of boiling water for each set of teat-cups. The flushing with boiling water helps to dry the rubbers and leaves the milk system dry and sweet.

(5) Then remove or open the plug or flap from the releaser-pipe, to allow of free circulation of air.

(6) Next clean the vacuum system in the same manner as the milk system, by drawing through first the caustic soda solution, and next the boiling water which has been circulated through the milk system. Pay particular attention to the cleaning of the pipe connecting the releaser to the vacuum tank, by flooding the releaser to cause the water to travel through the vacuum tank. This is important.

(7) The engine can now be stopped. Disconnect the two long rubbers from downpipes and teat-cups, and hang in a clean airy place out of the sun.

(8) Next disconnect the releaser, wash, rinse, and place in a clean, dry, sunny place; then disconnect the top or bottom half of the vacuum tank and treat in a similar manner.

To ensure effective cleaning by this method it is essential that it be carried out daily in the manner directed.

For Capacity Production.

Although every attention be given to the working of the soil, it will be found insufficient to make available the large quantities of plant-food required for constant crop production without the aid of fertilisers or manures. No amount of manuring, on the other hand, will produce good crops if the land is not well tilled. Fertility may be said to depend on a happy combination of the two factors.

Agriculture in the Tumut and Murrumbidgee Valleys.

H. WENHOLZ, B.Sc. (Agr.), Special Agricultural Instructor.*

It seems meet and fitting, when a town is honoured by the holding of a conference such as this, that some subject matter which concerns the agriculture of the district should be treated rather than an attempt made directly to interest the delegates who, it is realised, come from many different farming sections. The title of the paper is somewhat ambitious, but partly because you will have the opportunity of seeing something of the agriculture of the district yourselves, and because some of the local farmers can tell you more of what is done in farming here, and partly because this paper is only intended to be a short one, the subject matter is not expected to reach the ambitions of the title. It will, therefore, touch only on pha·es of the agriculture of the district, expanding these into the potential development of the latent resources along some lines, in the hope that they will be of value to local farmers and have some interest to the delegates during their visit.

The alluvial soils of the Tumut Valley may rightly be regarded as some of the most fertile in Australia. This is largely due to their regular and repeated flooding and consequent enrichment with silt. Apart from the usually good winter and early spring rainfall in the Tumut watershed, the Tumut flats may be surpiisingly inundated at any time in consequence of warm, dry weather in early spring melting the Kiandra snows.

In the early history of the world, the development of the human race was largely associated with the fertility of the soil. The food supply was one of the most pressing problems, and the rich valleys of Egypt and Mesopotamia were the centres of the earliest occupation and progress of civilisation. Similarly, in the early history of New South Wales, the most fertile areas, such as the Tumut Valley, were sought by explorers and settled by pioneers, and in the descendants of many of the latter who are still in the Tumut district is undoubtedly reflected the advanced civilisation and progressiveness of their ancestors who discovered these fertile valleys. But, side by side with this early intelligent development. there has also grown up a less thoughtful group of farmers who obtained possession of the land, and either through indolence or satisfaction with a much lower standard of life, have abused or failed to put such land to its best economic use. The result is that whereas there are to be seen in the Tumut district many farmers who are developing the agriculture of the district along most progressive lines, there are others who are unfortunately retarding this development in a greater or less degree. Good and poor farmers exist side by side in almost every district, but nowhere, perhaps, is this contrast as great as in the Tumut district.

* Paper read at the Fifth Conference of Southern Branches of the Agricultural Bureau, held at Tumut, 24th to 26th March, 1925.

Although some extremely fertile soils which are regularly enriched by flood silt exist, particularly in sections along the Tumut River, there is quite an appreciable area of bottom land which does not so regularly become flooded or silted, and which has been exhaustively cropped for many years. Such land stands urgently in need to-day of vastly different treatment to the punishment it is getting, which can be given with comparative impunity to the most fertile soils.

On the richest soils maize is the principal crop. This crop is particularly suited to the Tumut district, and some of the highest yields in the State are obtained here. With the variety most largely grown (Early Clarence), some of the biggest cobs ever seen (often weighing up to 1½ lb. or more) are produced in this district The quality of Tumut maize is renowned. It has even a world-wide reputation, a sample from Tumut taking a prize at the Franco-British Exhibition some years ago among maize from all parts of the world. The chief reasons for this high quality in Tumut maize are the fertile soils and the climatic conditions, which favour slow ripening and militate against the development of weevil in storage. A few other miscellaneous crops, such as tobacco. broom millet, lucerne, and potatoes are grown to a small extent on these rich soils, but maize bulks so largely that it is practically grown continuously. It may be wondered by some why lucerne is not grown to a greater extent here, but it is so easily drowned out by flood submersion, or too high a water table in the winter on the low flats, that it is largely put out of court here. For similar reasons, dairying is practically out of the question on many farms which have no high land for the stock. Maize, then, is the king crop, and on the flats periodically enriched it is grown with very good results practically every year. Under these conditions progress in agriculture amounts to seeking methods whereby the yield of the maize crop may be increased.

Where this yield is already over 100 bushels per acre, it would not seem that much is required to be done, or is possible. But fortunately, the urge with some progressive farmers is not to be satisfied until they are making the land produce to its best available capacity, and already it has been shown that on these rich soils the yield of maize can be still further increased in outstanding fashion. Two practices, which are not by any means general in the district, but which have been definitely shown to affect the yield markedly even where 100-bushel yields are obtained without their use, are worth mention.

The first is an early ploughing—autumn or early winter—instead of spring as is so much at present the practice. Wheat-growers who are accustomed to a twelve months' fallow for their crop will readily appreciate the importance of ploughing land for maize a few months instead of a few weeks before sowing. Unfortunately, there is a danger in some instances where the land is subject to the erosion of flood waters. But this danger exists only on small areas where a strong current flows at flood time, whereas a large part of the flat lands is subject only to backwater flooding with no risk of scouring. It is on such land that a failure to plough in the autumn or early winter

may be reckoned to be limiting the yield at present bv 15 or 20 bushels per acre. As previously mentioned, some progressive farmers in the Tumut district are already greatly enhancing their yields by this early ploughing.

The second method of securing increased yields on these already rich soils is, strange to say, by the use of fertilisers. On some of the richest soil on Tumut Plains, fertilisers were shown to increase the yield of maize from 112 to 133 bushels per acre in 1921, and increases of 10 to 15 bushels per acre have been obtained in previous years. The explanation probably lies in the fact that the fertiliser has most effect in giving the crop a quick start (which is maintained throughout the growth) in the usually cool spring weather, but, whatever the cause, the farmers who have had the boldness and the inquiring sense to make the experiments under what might seem obviously hopeless circumstances should well be regarded as benefactors to their district.

Other problems, such as disease (as would naturally be expected with continued cropping), are beginning to make themselves felt here; but there will be no time to treat of these in this paper.

It is, however, as previously stated, the agriculture of the less fertile alluvial soils further back from the river frontage which stands in need of some adjustment. This adjustment is necessary largely in the direction of more efficient utilisation, and some means of soil renovation or of building up the soil fertility which will prevent the decline of crop yields which is noticeably taking place here. Maize-growing or even oaten green feed or hay cannot be the constant and continued order of cropping on these soils with impunity. The time has already arrived when the most thoughtful farmers in the district are searching for some means of restoring some of the fertility to these soils. Dairying is the first means of checking the drain of fertility, which takes place rather quickly where crops are raised and almost entirely transported from the farm. The combination of stock with agriculture retains much fertility on the farm, which is largely reflected, in comparison with an unstocked farm, in the diversity and character of crops grown. But this alone cannot be expected to be a panacea for the soil wearing ills of the farm.

Soil-improving crops, or crops which by being grown in rotation with the main crops either maintain or improve the soil fertility, almost generally belong to the class of plants called legumes. Catch crops, such as cowpeas and field peas, have been tried with some little measure of success, but it is only recently that some farmers (and very few so far) have taken up the growing of clovers. This development may confidently be regarded as the beginning of a sound foundation for the superstructure of an improved agriculture in the Tumut district. Not only have the clovers a markedly beneficial effect on the soil for subsequent crops, but they may be expected to provide a long-felt want in furnishing leguminous hay or grazing for stock. In the absence of lucerne hay, clovers provide a first-class feed with a high percentage of protein, which is necessary for continued heavy milk production or growth in young stock, and which is mostly lacking in the other feeds grown or in the pastures for many months of the year.

It is not yet definitely known which clovers are going to be best adapted to the conditions here. There are a number of good clovers—some annual and some biennial in character—and it is likely that individual circumstances and conditions will play a large part in their choice. But the eyes of Tumut farmers should at least be turned to the trials that are been made by the pioneers in this development, for they are bound to make their mark sooner or later on the farming of all but the most fertile soils in the Tumut Valley.

Let us pass now to the agriculture of the Murrumbidgee Valley. Here the soils are higher and the conditions drier than in the Tumut Valley, and although the flats are subject to flooding in wet years, it is not such a constantly recurring phenomenon as in this district The soils are nevertheless rather fertile generally, and are admirably adapted to lucerne growing. A good flooding or thoroughly soaking rains in the winter practically make lucerne and other summer crops largely independent of summer rainfall, except what comes usually in the shape of summer storms.

The sight of several hundred tons of baled lucerne hay at Wambidgee is an indication that this crop is finding an excellent niche along this valley, but the greatest agricultural concentration is situated about Gundagai. Although lucerne is destined eventually to be the most popular crop in this district, the comparatively recent settlement, combined with the difficulty and expense of working rapidly up to large areas with this crop, has caused settlers to seek another large scale crop which will prove sufficiently profitable to grow in the meantime.

Maize has filled this role during the last few years admirably. With good seasons, and, it must be said, good methods of cultivation, and the use of good varieties, found after diligent and progressive experimental trials, maize-growing has stepped forward from the stage of a few hundred to several thousand acres in a few years, this district now vieing with Tumut as to which is having the largest area under crop.

With some exceptions, the Gundagai maize-grower is more progressive in his methods than his Tumut brother. Inside three years, after the careful testing of several varieties of maize in comparison with the local white, which was about the only kind formerly grown, 80 or 90 per cent. of the maize grown on the Murrumbidgee flats here is now of the Funk's Yellow Dent variety, which has succeeded so well that many farmers can reckon that (with their large areas) its introduction has been the means of putting several hundred pounds sterling more into their pockets. This is not to say that Funk's Yellow Dent is likely to displace Early Clarence from the rich Tumut soils, but it has already shown in several places that it is a very good variety on the moderately fertile or second-class soils in the Tumut Valley.

During the last three or four years, 100-bushel crops of maize have not been uncommon in the Gundagai district, and during one season this yield was exceeded with little more than an odd thunderstorm or two during the growth of the crop. The reason for this is to be largely sought in the early ploughing

and good fallowing and cultivation methods of the Gundagai farmers, which serve to ensure the greatest possible reserve of moisture in the soil in view of the drier periods of the summer. Probably on account of the warmer conditions in spring and the comparative virginity of the soil which has not been long cropped, fertilisers have not so far shown much promise in augmenting the yields here.

Most Gundagai farmers are aware, however, that maize is more or less of a stop-gap until they can get the land largely seeded to lucerne. This district bids fair to become one of the great lucerne-producing areas of the State. The dry climate makes the crop easy to handle under big-scale methods, and some growers with efficient means of handling, with tractors used for hauling and baling in the field, claim that they can put baled lucerne hay into their sheds for 15s. per ton.

It has been mentioned that the Gundagai district has been blessed with three or four consecutive good seasons, and as sure as night follows day, the adverse ones will come. The big lucerne-grower may find compensation in the good prices for his lucerne, but the maize-grower who has not been able to hold his maize in quantity will find times hard. With maize, his main crop, failing to cob, areas from which he produced hundreds of pounds worth will be practically worthless without stock

Herein lies the key to the defying of drought in the Murrumbidgee Valley—and the farmer who can defy drought in any part of the State can reckon himself among the fortunate. That the Gundagai district can boast of the world's record-producing cow—Melba XV - is some indication that the district is well suited to dairying. But no better indication is required than that lucerne, maize for fodder or silage, and grain can be produced well here Add to this the fact that these feeds can be stored, all three quite well on the spot for long periods of time, which can scarcely be said of many other districts in the State, and you have the reason why this district should be among the foremost dairying districts in New South Wales. Some day it will turn more to its rightful heritage.

Give Children Honey.

Professor Cook says:—We all know how children long for candy. This longing voices a need, and is another evidence of the necessity for sugar in our diet. . . . Children should be given all the honey at each meal time that they will eat. It is safer, will largely do away with the inordinate longing for candy and other sweets, and in lessening the desire doubtless diminishes the amount of cane sugar eaten."

Ask the average child whether he will have honey alone on his bread, or butter alone, and almost invariably he will promptly answer, "Honey." Yet seldom are the needs or the tastes of the child properly consulted. The old man craves fat meat; the child loathes it He wants sweets, not fat He delights to eat honey. It is a wholesome food for him, and is not expensive. Why should he not have it?—*Agricultural Journal*, British Columbia.

"Downy Mildew" of Rhubarb.

Peronospora jaapiana, Magn.

W. A. BIRMINGHAM, Assistant Biologist.

During a visit to Windsor, in 1923, Mr. W. H. Spinks, Orchard Inspector, drew my attention to a disease of rhubarb plants in his garden.

Examination showed that a " downy mildew " fungus—*Peronospora* sp.—was consistently associated with the condition.

A little later in the same year Mr. T. H. Harrison, Hawkesbury Agricultural College, Richmond, showed me the disease attacking rhubarb in the College garden.

Symptoms.

The fungus produces small to large, angular, fawn to light brown areas on the upper surface of the leaves (see Fig. 1). At first the spots are more or less restricted in their spread by the larger veins, but later even some of these give way to the fungus. In the early stages of formation of the spots, they are much less conspicuous on the underside of the leaves, but eventually become brown in colour as on the upper side.

On the surface of the spots on the lower side of the leaf the fungus produces its spores, which are borne on minute, branched tree-like structures (conidiophores, see Fig. 2). When examined by means of a hand lens magnifying ten times, the fungus resembles a miniature scrub-like growth, with a fawn tinge of colour.

As the spotted areas age they become torn, ultimately falling away, leaving large holes in the leaf; the large veins may then become broken, and the leaf is reduced to a lacerated and torn mass (see Fig. 3). The cause of the disease is a fungus—*Peronospora jaapiana*, Magn.

Preventive Measures.

No experiments have been carried out for the control of the disease, but it is reasonable to expect that it will respond to the treatment recommended for other "downy mildews," *i.e.*, spraying with Bordeaux mixture. The strength suggested in this case is: 1 lb. bluestone, 1 lb. *freshly*-slaked lime to ten gallons of water. (For preparation of Bordeaux mixture see Spray Leaflet No. 1).

Spraying should commence before the disease actually makes its appearance, and an endeavour should be made to keep the leaves coated with a film of the fungicide throughout the growing season. The spray must be directed well on to the lower side of the leaves.

All diseased material, as far as possible, should be destroyed by burning.

Description of the Fungus.

Conidiophores up to six times dichotomously branched, the last branches short and pin-pointed, from 249 to 346 microns* high by eight to thirteen microns at the broadest part of the stalk. Spores ovate, finely granular, tinged violet to smoke-coloured, twenty-six to thirty-two by fourteen to twenty-one microns. Oospores were not observed.

I am indebted to Mr. H. Wenholz for the translation of the articles by P. Magnus; to Mr. G. R. Bisby, Imperial Bureau of Mycology, for extracts and drawings; to Mr. W. H. Spinks for the material used, and Mr. W. J. Reay for the photographs.

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* A micron equals one twenty-five-thousandth of an inch

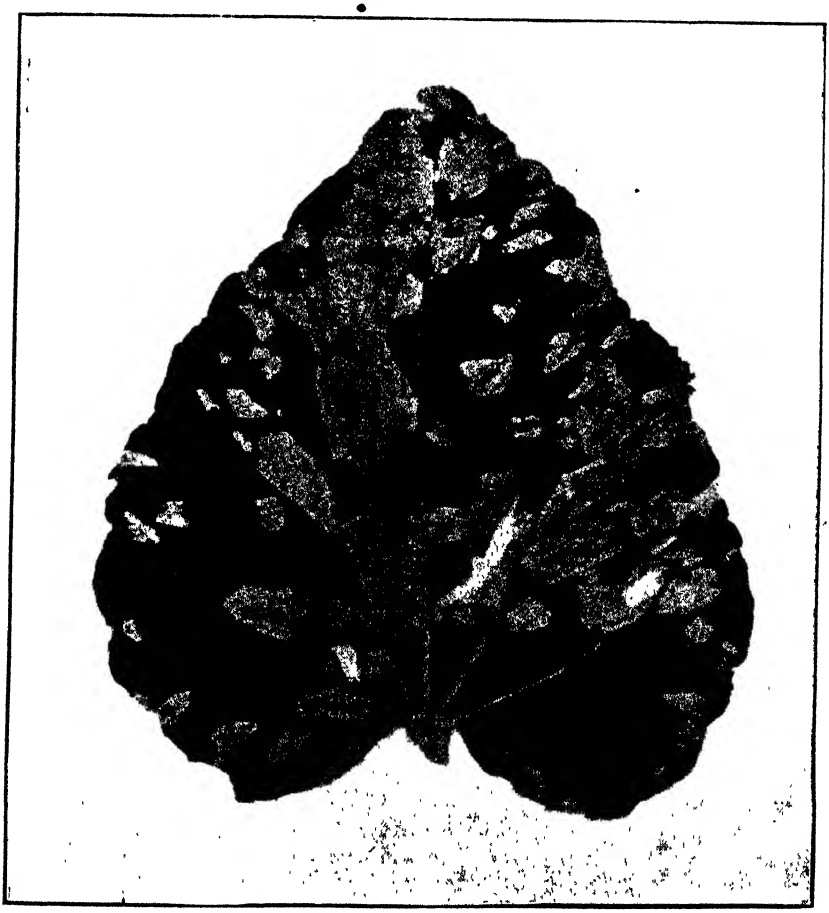

Fig. 1.—*Peronospora jaapiana* on rhubarb.

Fig. 2.—Conidiophores and spores of ***Peronospora jaapiana*** **from rhubarb leaves, Windsor. Camera lucida, by W.A.B.**

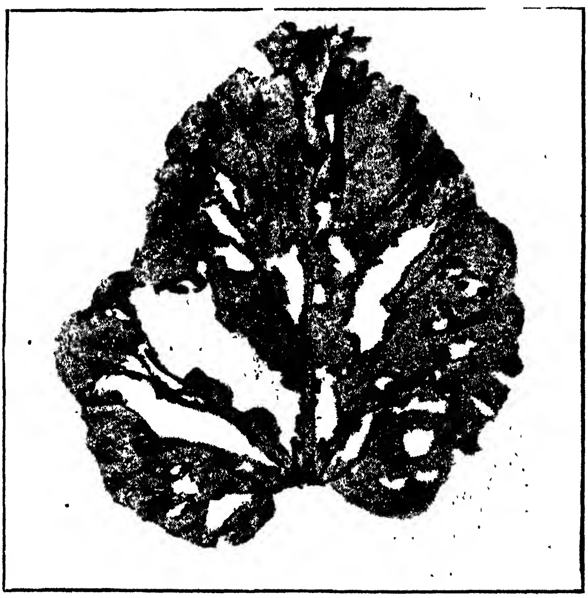

Fig. 3.—*Peron spora jaapiana* on rhubarb, Windsor, advanced stage. The diseased tissue has fallen away leaving large holes with torn edges.

Pruning the Ohanez and Cornichon Vines.

J. M. ARTHUR, Orchardist, Hawkesbury Agricultural College.

THE Ohanez variety of grape produces a strong vine, requiring to be grown on trellis. It gives much superfluous rank growth, and with the systems of pruning usually employed is inclined to be a shy cropper The writer, having noticed that a second crop was produced on laterals arising from the main cane, experimented with these along the lines of summer topping, and in doing so discovered that by using the lateral growths heavier crops were obtained.

The method adopted at Yanco, in consequence of this discovery, was as follows:—The vines were headed to a wire 2 feet 6 inches from the ground, and a short permanent arm about 1 foot 6 inches long was formed on either

An Ohanez Vine pruned as suggested by Mr. Arthur.

side. From each arm two rods, or more, according to the age and strength of the vine, were taken and twisted round another wire about 15 inches to 18 inches above the lower one, and another cane from the end of each permanent arm was twisted round the lower wire. In each instance a spur of two eyes was left at the base of the cane, as well as one or two intermediate spurs, in order to insure a growth of canes for the following season's fruiting wood, the canes being renewed annually.

It is in selecting the canes to be used that the method advocated varies from that usually adopted. It is essential to use lateral canes coming off the main ones, and in order to force out these laterals the new growths must be thumb-pruned. This pinching back must be done early in the season before the main canes are too long, in order to force out a lateral as near the base as possible, and to allow time for maturity. This practice was followed for several years at Yanco Experiment Farm, with greatly improved results.

The Cornichon variety is naturally a fair-sized berry, and responds readily to rod-pruning. If pruned to spurs it sets a light crop of very large berries, but it is doubtful if the lighter crop and larger fruit is a better paying proposition than to prune for a heavier crop while still procuring a berry above the medium size of most grapes. Short or spur pruning may be the better system if applied on the heavy soils, or where irrigation is not practised.

This variety almost invariably produces a big crop, but in some seasons, for no apparent reason, it fails. It can then generally be forced to produce a second or late crop by summer topping of the current canes. It is necessary to do this work early in the season in order that the lateral growths will be forced out in time to produce and mature this late crop. The latter is inferior to the main crop in quality, colour, and sugar content, but owing to its lateness it generally realises payable prices. I do not think this method of getting a late crop would apply to the coastal or tableland districts, the autumn being too short to allow time for ripening. The forcing of the production of the second crop does not seem to weaken the vine, or to interfere with the following season's crop.

Muriate of Potash Fertiliser

In a paragraph on page 870 of the December, 1924, issue of the *Agricultural Gazette*, reference was made to certain deleterious effects of the fertiliser muriate of potash on maize. The fact that the muriate of potash was used in a mixture with superphosphate was not stated in the paragraph. Nearly all the potash fertilisers used in this State are used in mixtures of which superphosphate is generally the base.

It is apparently the mixture with superphosphate that is the cause of the trouble. The matter has been investigated by the Department's Chemist, who reports that commercial muriate of potash contains as impurities salts of calcium and magnesium, existing, in part at least, as chlorides. When mixed with superphosphate these chlorides immediately yield hydrochloric acid—sufficient explanation of the trouble with muriate to which reference was made.

The agents importing muriate of potash point out that the fertiliser obtained during the years immediately following the armistice was of Alsatian origin, and that in the high grade now obtainable these impurities do not exist. This phase of the subject will be the subject of further investigation and experiment.—H. Wenholz, Special Agricultural Instructor.

The Wintering of Bees.

W. A. GOODACRE, Senior Apiary Instructor.

WHILE the wintering of bees in New South Wales is carried out in a uniform manner so far as the preparation of the bees, hives, and stores is concerned, there is a variety of climatic conditions for the colonies to contend with. What allows the uniformity in preparation is that we have no extremely cold climates such as are found in the United States of America or in other cold countries, where in many cases special winter packing of bees is necessary.

We have the warm climates, such as the coastal areas and some inland places, where the bees are fairly active during the whole of the winter. Then we have the cool districts, where brood rearing is practically cut out during the cold months, and the bees go into a restful, quiescent, or semi-hibernating state. To the close observer, a comparison of these wintering conditions results in obtaining some interesting information. In the warm districts, the bees, being active during the winter, find it necessary to rear a fair quantity of brood, to make up in young bees the loss sustained by the field bees from expended energy, the length of life of the bee being governed to a large extent by the energy put into its work. In the general run of seasons, the flora is not sufficient for stimulating conditions in the hive during winter, and consequently a fair amount of foraging is done for a small return in the way of stores. The brood rearing which is carried on generally does not make up fully for the loss in field bees, and the colonies in these warm districts are weakened to a fair extent for the commencement of their early spring work.

In the cool climate, brood rearing is practically given up altogether during the winter, and the colony enters into a quiescent state for about three months. This allows a strict reservation of vitality of the worker bees, and the queen, too, is no doubt benefited by the spell from egg-laying. Under these conditions the colony is enabled to come through the winter with small loss of vitality or of population. It appears evident, therefore, that for just the particular winter period a cool climate is preferable.

There are other matters, however, which assist in the balance of these conditions. In the warm districts a more settled condition of the weather obtains generally during the early spring, and the colonies, although somewhat weakened by winter activity, are enabled to build up rapidly in the spring. In the cool climates, more or less unsettled weather prevails during the early spring, the result being that brood rearing is retarded and the colony does not make such headway.

Where two combs well clustered with bees may do good work during the early spring in a warm climate, a larger cluster is necessary in the cool parts. It will be seen, therefore, that in the cooler districts better wintering conditions are necessary. If we could get a cool district to winter the bees in, and a warm one to bring them to during the early spring, we would come near ideal conditions, in my opinion.

An endeavour was made by the Department during the past season to import queen bees from Carniola, but they did not survive the journey. This was rather unfortunate, as these bees are reared in a cold alpine climate, and it would have been of much interest to see how they would succeed in our cool districts, especially immediately following the winter, when the cool changes in the weather affect the general strain of bees. There are no doubt certain strains of bees that winter better than others ; this was demonstrated clearly in our recent queen bee competition. It is therefore advisable to observe closely the wintering qualifications of the best strains, so that by selection in breeding an improvement may be made.

Prevention of "Oat Smut."

When only a few smutted plants appear in a crop of oats the yield is not affected to an extent which would justify seed treatment. However, if 5 per cent. or more infected plants occur in the crop, the grower is well advised to treat the grain saved from such a crop for seeding purposes.

Oat smut can be prevented by pickling the seed. On account of the structure of the oat, formalin has proved to be the most effective fungicide for this purpose. The grain should be dipped for 10 minutes in a solution of formalin made up at the rate of 1 pint of formalin to 40 gallons of water. It should then be sown within a period of 24 hours from the time of treatment. Every care should be taken to measure the quantities of solution required, and to see that the grain is not treated for too long a period, or left too long before sowing. It is better to sow such seed moist, rather than allow it to dry. The treated grain should not be placed in dirty bags, or it may become reinfected.

Formalin injury occurs especially when the treated grain is sown in a dry seed-bed. Seed injury may be lessened by following the formalin pickle by treatment in lime water (1 lb. lime to 10 gals. water) prior to sowing.—R. J. Noble, Principal Assistant Biologist.

Return of Infectious Diseases Reported in February.

The following is the return of outbreaks of the more important infectious diseases reported during the month of February, 1925 :—

Anthrax	Nil
Contagious pneumonia of swine	,,
Pleuro-pneumonia contagiosa	,,
Piroplasmosis (tick fever)	,,
Swine fever	,,

—Max Henry, Chief Veterinary Surgeon.

A Crowing Rooster.

Can anything be done to prevent a rooster from crowing during the night ?

On the assumption that a bird cannot crow without lifting its head, replied the Poultry Expert, wire netting is sometimes stretched just over the perches at a height that will allow the birds to get on the perches, but will not allow the cock to crane his neck to crow.

Experiments in the Processing of Passion-fruit.

W. J. ALLEN and W. LE GAY BRERETON.

EXPERIMENTS carried out by the Department some years ago in the processing of passion-fruit pulp showed that while there was no difficulty as to the keeping of the product the flavour of the fruit was easily impaired by heat. As the cultivation of passion-fruit is extending into new areas and the production is likely to increase, further experiments were carried out last year in order to ascertain, if possible, the lowest temperature and the shortest period of cooking that could be relied upon for processing the pulp These later tests were started in February, 1923, under the direction of the late Mr. S. A. Hogg, and were continued from time to time as supplies of fruit were available and time permitted. The temperatures employed ranged from 140 degrees to 190 degrees Fah., in gradations of 10 degrees. Each of these temperatures was tested for periods of 2, 5, 10, 15 and 20 minutes.

The results of these tests indicated that temperatures below 180 degrees Fah., even when cooking for 20 minutes, cannot be relied on, but that a period of 20 minutes at 180 degrees Fah. is worthy of further trial. Pulp cooked at this temperature for 20 minutes both with and without sugar on 10th May, 1923, when opened on 13th August, 1923 (after three months), was quite sound but markedly lacking in the characterististic passion-fruit flavour. The fruit this pulp was made from was inferior in flavour to that of the former lots.

The pulp with 5 per cent. sugar was superior in flavour to that containing 10 per cent. sugar, while that with no sugar was insipid. Processing in each case was carried out by placing the sealed filled cans in a cold cooking bath, raising the temperature to 180 degrees Fah., and maintaining this temperature for 20 minutes. All the above tests were carried out with lacquered round tins containing 13 oz. of pulp.

On the same date (10th May, 1923), seven 5 lb. lacquered tins were put up—three containing 5 per cent. sugar, three containing 10 per cent. sugar, and one without sugar. These were processed by placing sealed cans in a cold cooking bath, raising the temperature to 190 degrees Fah., and holding at that temperature for twenty minutes. One of the cans with 10 per cent. sugar was swelling on 7th June, 1923, and was punctured, re-sterilised and sealed, and on 25th September, 1924, was apparently sound. On 28th December, 1923, another of the cans with 10 per cent. sugar was distinctly swollen, and the contents when tested proved to be slightly fermented. The remainder of the cans, when examined on 25th September, 1924, (after

sixteen months) all appeared sound. Their contents were tested on 16th October, when the representatives of the canning and kindred interests who were present were asked to reply to the following questionnaire :—

1. Is the pulp sound?
2. Can any foreign flavour be detected?
3. Is the passion-fruit flavour satisfactory?
4. Which sample is of the best flavour?
5. Is the pulp of satisfactory appearance?
6. Which sample is of the best appearance?

1. From the replies it can be assumed that the sugar nil and sugar 5 per cent. samples were sound. The only can of sugar 10 per cent. available was the one that had shown signs of swelling and been re-sterilised twenty-eight days after canning.

2. The opinion was unanimous that no foreign flavour was apparent.

3. Four replies expressed the opinion that all three samples were satisfactory, four that the sugar nil and sugar 5 per cent. samples were satisfactory, and one that the flavour was not perfect. The sugar nil and sugar 5 per cent. samples may therefore be regarded as satisfactory.

4. Five replies indicated sugar 5 per cent. as having the best flavour, and four replies favoured sugar nil.

5. Seven replies gave the appearance of all samples as satisfactory and two replies gave sugar nil and sugar 5 per cent. as satisfactory.

6. Five replies indicated sugar nil as having the best appearance, and four replies favoured the sugar 5 per cent. sample.

Though all the 13 oz. cans processed at 190 or 180 degrees Fah. for twenty minutes kept sound, some of the seven larger 5 lb. tins did not keep, and for the present it would not be wise to recommend 190 degrees Fah. for twenty minutes for the large sized cans. Further tests will be carried out in this connection.

The lacquering of cans showed slight defects—not in the body of the cans, but on the seams and around the sealing of the tops. Analysis showed, however, that the amount of tin absorbed by the pulp was well under the amount allowed under the regulations of the New South Wales Pure Foods Act. Endeavours will be made to obtain a more perfect lacquer.

Examination of the pulp for tin resulted as follows :—

	No sugar sample.	5 per cent. sugar sample.	10 per cent. sugar sample.
Tin expressed in terms of 100 parts pulp ...	·00031	·000708	·00149
Tin expressed as grains per pound pulp ...	·0217	·0496	·1043

"Under the regulations of the Pure Foods Act of this State," points out Mr. A. A. Ramsay, Chemist, in submitting these figures, "tin is permitted up to 2 grains per pound. The no-sugar, 5 per cent. sugar, and 10 per cent. sugar passion-fruit pulp above contain only one one-hundredth, one-fortieth and one-twentieth respectively of that amount."

Poultry Notes.

APRIL.

JAMES HADLINGTON, Poultry Expert.

THE selection and mating of breeding stock is the most important work to claim attention during this month. To those who commence hatching in June the advisability of having the hens or pullets settled in the breeding pens by the first of next month will be obvious. The male birds might be put in right away, or if desired, a week or two later. Early mating is most desirable, because, while fertility might be expected in a few days after mating, so short a period is not to be relied upon, especially after long separation

A good deal of the trouble experienced with infertility at the commencement of the hatching season is due to the erroneous notion of poultry-farmers in this regard. Many think that long separation of the sexes will make for better results, but experience proves that the contrary is the case in most instances, and particularly so with heavy breeds. With Orpingtons, for instance, it is a matter of experience that fully one-third of the cockerels kept segregated until they are twelve months old become sterile or practically so. The same thing happens when birds are taken out of the breeding pens and kept for any great length of time. As a matter of fact, separation of the sexes during the moulting period is really all that is advisable or necessary. Of course, all the birds on the farm are not involved, seeing that the great bulk of the stock kept are simply laying stock with which no male birds need be run; but the practice of breaking up the breeding pens at the end of the hatching season (say October) and keeping the breeders segregated until the following May is, to say the least, more detrimental than beneficial.

It is quite understood that the foregoing will raise the question of fertile *versus* infertile eggs for market. The ideal, of course, would be to market only infertile eggs ; but this ideal, like many other counsels of perfection, is more honoured in its breach than its observance, and it would be still more so if the subject was properly understood.

Many poultry farmers are at their wits' end to know what to do with their male birds during the off season, wishing to be able to supply only infertile eggs for the market, and often suffering loss in consequence of the obsession. At the risk of appearing iconoclastic one must contend that the infertile-egg idea is much over-stressed.

What really matters is the subjection of fertile eggs to such a temperature and for such time as will result in the starting of incubation. If ordinary precautions are taken in our coastal areas, where the great bulk of our eggs are produced, nothing of the kind will happen, for the reason that the temperature is rarely sufficiently high and long sustained to bring about that condition. There are, of course, people who think they can distinguish a fertile from an

infertile egg, but this is an illusion. Only by the aid of a miscrocope can it be determined, and then only after minute dissection. The facts in this connection are that while poultry-farmers are exhorted to send only infertile eggs to market during the season of export and cold storage, there are thousands of cases of eggs so disposed of a large proportion of which are fertile, and of which there is no complaint for the simple reason that there is nothing to complain about.

The writer would not, in the absence of experimental data, be prepared to aver that the keeping qualities of fertile eggs are quite equal to those of infertile ones, but he does contend that for all practical purposes, and when due care has been taken, no concern should be felt with regard to the matter. We have been constrained to deal with this matter out of consideration for hundreds of conscientious poultry-farmers who are on the horns of a dilemma—desiring to know how to preserve their breeding birds and at the same time to supply only infertile eggs to market.

Matings.

On the question of matings many inquiries are made as to ages and conditions. Should cockerels be mated to pullets, hens to cocks, cockerels to hens, or cocks to pullets are some of the queries usual at this time of the year. In this regard truth and fallacy are curiously mixed. To answer these questions one requires to be in possession of information as to all the conditions in each case, but the determining factors can be stated thus :—

There is nothing against mating pullets and cockerels providing: (*a*) the ages are 10 months and over when eggs are required for incubation; (*b*) that both sexes are well-developed specimens; and (*c*) that they are not too closely related. Both (*b*) and (*c*) are applicable to each of the mentioned classes. The idea that age is necessary on one side or the other can be ignored, except to say that birds under the age mentioned are immature and it is inadvisable to breed from them.

With regard to mating older birds on both sides two factors have to be reckoned with. Aged hens are likely to be a month or six weeks later in commencing to lay than good forward pullets. On the other side, aged males, especially in heavy breeds, are not as a rule very dependable in the winter. The result in either case might be a late start with hatching as compared with the possibilities from younger stock.

Another common query is with regard to blood relationship in matings. This is a more complex question than is generally imagined. It is not sufficient to make matings according to some chart showing a mathematical procedure on blood lines. By itself this might lead to degeneracy. It is only by proper selection, keeping in mind the main objective, that any good can come out of line breeding either in egg production or in quality in other respects. In short, selection must take precedence over all other factors. The facts in this connection are that many farmers who are obsessed

with the idea that line breeding is the be-all and end-all of high production capacity might do better by outcrossing, if they kept in view affinity of type and character of the birds to be mated.

It is now a known fact, the outcome of experiments, that many high layers produce pullets of low productive capacity, and also that some low-producing hens are the dams of high-producing pullets. There is, therefore, all the more need for intelligent continuous selection of the specimens to be mated. In making such selections, length, breadth, and depth, according to the breeds, are points that must be taken into account. Good development in these points indicates constitution, while fine quality in head points (such as texture of comb and wattles and length and fineness of skull), and pliability of the skin of the abdomen are indicative of high laying ability. Coarseness in any of these points indicates the poor layer.

In this connection it might be pointed out that, while there may be no formula for breeding layers, much can be accomplished by making good selections for breeding stock continuously year after year. This must be regarded as the supreme factor in any effort to increase average laying capacity. Side by side must also proceed selection for the maintenance of constitutional vigour.

When selecting White Leghorn pullets as breeders at this time of the year most of the early hatched birds will lack that freshness in appearance to be seen in the later ones. This is due to the fact that they have, perhaps, been laying for some time, and are breaking into moult. The selector should not be deceived by this feature. It is to the older pullets that he must look for his breeding stock. This fact will, of course, increase the difficulty of making a good selection unless the birds have been marked while fresh. With regard to the hens, those selected as breeders should have finished their moult before the end of May; any later than that will come into the category of late moulters, too late to make good breeders. Birds carrying their old feather into mid-winter will not have time to recover from the somewhat exhausting period of moult in time for the breeding pens.

Chicken-pox Season.

This is the season of the year when chicken pox is usually prevalent. This disease is one of the afflictions that poultry-farmers fear. Not so many birds die from it as is sometimes alleged; but the effect on a flock of pullets at this time of the year is disastrous owing to the fact that if they have come on to lay they will at once stop, and if they have not, the disease will retard them for some weeks to come. For some years past a warning has been given in these notes about January of each year, and advice as to how young stock might, to a certain extent, be protected, at any rate from a severe attack.

It has been observed that many who have practised these preventive measures say that they still have some chicken pox, in spite of the treatment. This is quite possible, but it is a question of severity. All the cases

that have come under notice have been of the lightest description; in fact, one would have had to look closely into the flocks to find the disease. The point is, that if the disease had caught the birds unprotected a very different tale would have been told. Instead of the disease appearing with a few innocuous eruptions on the comb and wattles, the whole of the fleshy surface of the birds' heads would have been a mass of sores. Such a condition is due to the irritation of the eruptions having been so great that the birds have scratched themselves; these sores may spread to the eyes, so that the birds are unable to see. It is this that brings about death when it occurs in this disease, starvation rather than the disease itself being the real cause.

Farmers who have not had such an experience of chicken-pox are unable to realize the full significance of it, or to appreciate what they have saved themselves by the protective methods devised. There are others who have not carried out the protective treatment in the manner set out, and they have suffered in consequence.

The main thing for such as have unfortunately got this disease into their flocks is to make an effort to dry up the sores and allay the irritation. For this purpose there is nothing better than tincture of iodine, used as a paint, with which the sores are lightly touched. Where the sores have got into the eyes the iodine is too severe, and ordinary laundry blue can then be used with good effect.

It should be recognised that chicken pox is a feverish disease, which, apart from the eruptions, lowers the vitality. Recovery will be hastened by the administration of a tonic, Douglas mixture being one of the best for the purpose.

How to Make Douglas Mixture.

How to make and use this mixture is not as well understood as it should be. The formula has previously been published in these notes, but new readers and the above facts constitute a necessity for again reproducing it. The method of making and using it is as follows:—Take 4 oz of sulphate of iron and 4 oz. Epsom salts; dissolve in 1 gallon of boiling water; let it cool, then add half an ounce of what is sold by the chemist as dilute sulphuric acid.

This is "stock" or concentrated mixture, *which must not be given to the birds in this form*. Bottle the mixture in a stone or glass (*not metal*) vessel, label it poison, and put it away. Two tablespoonsful of this mixture added to each gallon of drinking water on three to five days per week over a period of three or four weeks will be found one of the best poultry tonics known. It is cheap and easily made. The quantity advised is practically harmless to ordinary iron or galvanised drinking vessels, buckets, &c.

Care is necessary in using sulphuric acid so as not to get it on the skin, which it will burn severely, and a glass stoppered bottle is necessary to contain it.

Orchard Notes.

April.

W. J. ALLEN and H. BROADFOOT.

With later varieties of apples and pears harvesting is still in progress. To secure the best results fruit should be carefully picked, handled, and packed. It is important to place upon the market only such fruit as is in prime condition and of attractive appearance. The buyer is usually very critical. He sees a great range of fruit, and he knows that he who places the best before the consumer—best in quality and in appearance—has an immense advantage over vendors who are careless in such matters. In this connection it may be remarked that wrapping fruit helps to preserve it, and enhances its aspect. A clean case with well-graded, well-packed fruit, with an attractive label, makes a strong appeal to the most fastidious buyers. Some carters injure the appearance of cases by walking over them, and it is sometimes further detracted from by the cases being packed in dirty unswept trucks. Wiring of cases is strongly recommended, particularly when they are made of soft wood and intended for export. The best results are obtained by placing the wires about 1¾ inches from each end. Wires so placed will greatly minimise the loss by pillage and damage.

Clearing.

In some cases growers or prospective growers will be clearing land for future use. If the work is done by contract there are important points to be included in the agreement. Among the necessary stipulations (after agreement as to the price to be paid per acre) are :—

That the work is to be completed within a specified time.

That all stumps be removed to a specified depth.

That all stumps and trees that stand on the boundary of the area to be cleared be treated as though within the area.

That timber, logs, stumps, etc., be not rolled over the boundary line.

That all stump holes be filled in level to the general surface.

That all timber, except that agreed upon as being useful for fencing and other purposes, be burnt.

The contractor to follow the plough, and to remove all roots, etc., which obstruct the plough.

Progress payments up to 75 per cent. of the work done to be paid to the clearing contractor; the balance on completion.

Before fencing it is advisable to fell any trees that lean over the line to be fenced. If a contract is let for fencing, specification should be clearly drawn out stipulating the size of the posts, depth of post holes, number of wires, gauge of wire, distance posts are to be apart, distance apart of strainers, diameter of corner and gate posts, length of posts, kind of timber to be used, and so on.

Planting.

Citrus trees may be planted during the present month, provided the soil is in good condition and the locality is not subject to severe autumnal frosts. Care should be taken that roots are not exposed to the sun or wind. Too much care cannot be taken in the selection of trees. Only vigorous young trees should be selected, all others should be unhesitatingly rejected.

Pests.

It is pleasing to note that the depredations of the codlin moth were not so great this year as last. This should not lead growers to lessen their efforts to cope with the pest. It should rather make them determined to persevere with stringent measures, so as to get as near as possible to complete extirpation of a destroyer that exacts heavy toll if not kept in check.

As soon as the crop is removed it is advisable to give the trees a spraying with a nicotine extract for aphis. Plenty of force is required to break up the aphis clusters and dislodge them. That mentioned is a contact spray and must hit the insects to achieve a kill.

The apple leaf jassid has been very prevalent in some of the chief apple growing districts. The methods of control were published in a previous issue of the *Gazette*, but they may again be referred to. Jassids, or "frog hoppers' as they are called, suck the sap of leaves, causing them when the infestation is bad to shrivel. Injury to the leaf means injury to the tree and to its product. It is in the leaf that raw food material is elaborated into organised food material, and injury to an organ whose function is so important must result in loss of vitality to the tree. Another disability is that fruit is blackened by the exudations and excrement of the jassids, a discolouration which lessens, of course, its commercial value. In order to control the jassid pest clean cultivation is essential. Affected trees should be sprayed in early summer with a nicotine extract. This will destroy the first brood before it has time to develop.

Re-soiling.

The re-soiling of citrus trees is greatly to be recommended. It is conducive to health, vitality, productivity, and quality, and nothing but good can come of it if judiciously carried out.

Improving the Grazing Capacity in a Dry District.

A Grazier at Hay, who had netted his property and had largely controlled rabbits thereon, recently asked what grasses he might use to improve the carrying capacity of his land.

He was advised by the Agrostologist to plant as a mixture in April or May, 4 lb. Wimmera Rye grass and 1 lb. of Subterranean clover. The seed should be planted on cultivated land or distributed in broken country, such as dug-out rabbit burrows, stump holes, &c.

Pure Seed.

Growers Recommended by the Department.

The Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops, in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon, and (2) after a sample of the seed has been received by the Under Secretary and Director, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the prices for the seeds mentioned hereunder.

Wheat :—	
Canberra	Manager, Experiment Farm, Temora.
	Manager, Experiment Farm, Condobolin.
	Hobson Bros., Cunningar.
	J. W. Eade, Eade Vale, Euchareena.
	E. J. Allen, Gregra.
	E. J. Johnson, "Iona," Wongalia, via Parkes.
Clarendon	E. J. Johnson, "Iona," Wongalia, via Parkes.
Cleveland	Manager, Experiment Farm, Bathurst.
	W. Burns, "Goongirwarrie," Carcoar
Currawa	E. J. Allen, Gregra.
Federation	Hobson Bros., Cunningar.
	Gollasch Bros., Pine Park, Milbrulong.
Firbank	J. W. Eade, Eade Vale, Euchareena.
Florence	H. Harvey, "Rawsonville," via Dubbo.
Gresley	Manager, Experiment Farm, Cowra.
	Manager, Experiment Farm, Condobolin.
	Manager, Experiment Farm, Bathurst.
Hard Federation	Manager, Experiment Farm, Temora.
	Hobson Bros., Cunningar.
	J. W. Eade, Eade Vale, Euchareena.
Improved Steinwedel	E. J. Allen, Gregra.
	Hobson Bros., Cunningar.
Marshall's No. 3	E. J. Allen, Gregra.
	Hobson Bros., Cunningar.
	Hannett Bros., Linden Valley, Cunningar.
Onas	E. J. Johnson, "Iona," Wongalia, via Parkes.
Wandilla	Manager, Experiment Farm, Temora.
	Hobson Bros., Cunningar.
Waratah...	Hobson Bros., Cunningar.
Yandilla King	Manager, Experiment Farm, Temora.
	Hannett Bros., Linden Valley, Cunningar.
	Manager, Experiment Farm, Bathurst.
Oats :—	
Algerian	Manager, Experiment Farm, Bathurst.
	Manager, Experiment Farm, Glen Innes.
	Manager, Experiment Farm, Temora.
	Gollasch Bros., Pine Park, Milbrulong.
	F. Rose, junr., "Rosemount," Cunningar.
	E. J. Allen, Gregra.
Guyra	Manager, Experiment Farm, Glen Innes.
Lachlan	E. J. Allen, Gregra.
	W. V. Herbert "Bongalong," Muttama.
	Manager, Experimental Farm, Bathurst.
Mulga	E. J. Allen, Gregra.
	C. E. Prell, "Gundowringa," Crookwell.
	Manager, Experiment Farm, Temora.
	Gollasch Bros., Pine Park, Milbrulong.

Oats—continued :—	
Myall	C. E. Prell, "Gundowringa," Crookwell.
Sunrise	J. W. Eade, Eade Vale, Euchareena.
	C. E. Prell, "Gundowringa," Crookwell.
White Tartarian	Manager, Experiment Farm, Glen Innes.
Yarran	C. E. Prell, "Gundowringa," Crookwell.
Barley :—	
Cape	Manager, Experiment Farm, Bathurst.
Grasses :—	
Phalaris bulbosa	Col. H. F. White, "Baldblair," Guyra.
	Manager, Experiment Farm, Glen Innes.

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alterations of dates should be notified at once.

1925.

Society.	Secretary.	Date.
Gloucester A. H. and P. Association	F. S. Chester ...	April 22, 23
Richmond River A. H. and P. Society (Casino) ...	P. M. Swanson ...	,, 22, 23
Bathurst P. and A. Association...	....	,, 22, 23, 24
Orange A. and P. Association	G. L. Williams ...	,, 28, 29, 30
Upper Manning A. and H. Association (Wingham) ..	D. Stewart ...	,, 29, 30
Clarence P. and A. Society (Grafton)	L. C. Lawson ...	,, 29 to May 2
Hawkesbury District A. Association (Windsor) ...	H. S. Johnston ...	,, 30 to May 2
Dubbo P. A. and H. Association	Fred. Weston ...	May 5, 6.
Ulmarra P. and A. Society	S. Spring	,, 6, 7
Coonamble P. and A. Society	....	,, 12, 13
Maclean P. and A. Society	....	,, 13, 14
Kyogle P. A. and H. Society	D. Campbell ..	,, 20, 21
Trangie P. and A. Society	....	,, 26, 27
Bonalbo P and A. Society	....	June 3, 4
Warren P. and A. Society	....	,, 3, 4
Wagga A. P. H. and I. Society	....	Aug. 25, 26, 27
Grenfell P. A. and H. Association	G. Cousins ...	Sept. 1, 2
Cootamundra A. P. H. and I. Association	W. W. Brunton...	,, 1, 2
Young P. and A. Association	T. A. Tester ...	,, 8, 9, 10
Cowra P. A. and H. Association	E. D. Todhunter...	,, 15, 16
Ganmain A. and P. Society	....	,, 15, 16
Holbrook P. and A. Society	J. S. Stewart ...	,, 15, 16
Junee P. A. and I. Association	T. C. Humphrys...	,, 15, 16
West Wyalong P. A. H. and I. Association	T. A. Smith ...	,, 15, 16, 17
Temora P. A. H. and I. Association	A. D. Ness ...	,, 22, 23, 24
Canowindra P. A. and H. Association	J. T. Rue... ...	,, 22, 23
Lockhart A. and P. Society	....	,, 22, 23
Murrumburrah P. A. and I. Association	W. Worner ...	,, 29, 30
Barellan P. A. and I. Society	H. H. Cuthbert...	,, 30
Barmedman A. and H. Society	T. P. Meagher ...	,, 30
Corowa P. A. and H. Society	J. D. Fraser ...	Oct. 2, 3
Burrowa P. A. and H. Association	W. Burns... ...	,, 6, 7
Ardlethan A. Society	R. L. Neill ...	,, 7
Narrandera P. and A. Association	W. H. Canton ...	,, 13, 14
Ariah Park A. Society	J. F. McInnes ...	,, 14
Lismore A. and I. Society	H. Pritchard ...	Nov. 17, 18, 19

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Agricultural Gazette of New South Wales.

South Australia and New South Wales in Contact.

A Feature of the Bureau Conferences at Tumut and Parkes.

THE presence of Mr. W. S. Kelly, Chairman of the Advisory Board to the Agricultural Bureau in South Australia, was a most interesting feature of the Agricultural Bureau conferences lately held at Tumut and Parkes. At both conferences Mr. Kelly delivered speeches that were regarded as valuable contributions. The speech with which Mr. Kelly opened the conference at Parkes was denominated by the Hon. A. G. Manning as a classic among agricultural deliverances. It is thought the wide scope of that address and the importance of the subjects discussed justifies the publication of the following report of it in the *Agricultural Gazette.*—ED.

MR. KELLY said he came to New South Wales a firm believer in conferences, particularly in agricultural conferences, and most of all in conferences of the Agricultural Bureau. The Bureau system really had its beginning in South Australia some thirty years ago, and though in their State it had perhaps grown more slowly, they were proud that New South Wales should have seen fit to adopt the Bureau system too, and generally on the same lines. There were not many ways in which South Australia could take a paternal interest in New South Wales, but in regard to the Bureau they did so.

The Bureau had done a great deal in his State, having become the channel of communication between the Department and the farmer, and also the means by which the Department was able to collect valuable information, and convey it again to other farmers who otherwise would not have the benefit of the experience of their fellow-farmers.

In South Australia practically all the departmental activities used the Bureau. For instance, the short courses of instruction in agriculture were given to those nominated by the branches of the Bureau. In crop competitions and in fallow competitions they had been slower to move than in New South Wales, and in the latter they were only just making a start, but it was through the Bureau that the competitions were promoted in his State. It could be claimed that the Bureau had had a great levelling up influence in South Australia. The methods of Victorian farmers, for instance, had been explained to South Australian farmers at Bureau meeting so well and so frequently that he believed it was hardly an exaggeration to say that in South Australia, Victorian methods were quite as well understood by the average farmer as by the average Victorian—perhaps even better. The work of advocating fallow had been so consistently done by the Bureau that it was now a universal practice with their farmers, so that, as soon

as sowing was over, the teams were hitched on to the plough and fallowing commenced at once. In fact, the farmer over there who did not start fallowing within a week after sowing would be regarded as having slipped a cog or two.

"Concentrate on Agriculture."

While impressed by the large number of branches in this State, and by the large membership, there were one or two things he would venture to say. The first was that it was a mistake to attempt to redress the wrongs and woes of the world by motions at Bureau conferences. As a result of experience he would suggest that they should concentrate upon agricultural matters, and not overload the business paper. There were other agencies that might attend to the improvement of roads and other such matters. "The sooner we get down to our own job and improve our own working conditions, and even give our own Department a hand, the better." That kind of activity would help their agriculturists and their women. It was no good asking the Advisory Council to go round from one Department to another Department asking for this and that. It worked all right for a time or two, but they soon got to know who was coming and prepared their answers accordingly. Farmers themselves knew what it was to have folk coming along and telling them all sorts of things they should do, and they had a way of their own of discouraging a continuance of the practice.

Something in the way of co-ordination and co-operation between the Bureau in different States was necessary. In many ways interchange would be of great value to all concerned. He believed an interchange of officers between the Departments of Agriculture in the States of New South Wales and South Australia would be of advantage. An officer of this State might, for instance, visit South Australia for a month, and see the work of their institutions, observe their agricultural practices, and meet their experts. And a return visit each year on the part of South Australia would be equally profitable. He hoped such an arrangement would result.

Then he thought it would be of value if the farmers themselves knew something of what was going on in other States, and a summary once or twice a year of the work in South Australia published in the *Agricultural Gazette*, and a similar summary of New South Wales activities published in the South Australian *Journal*, would be of value on both sides. He acknowledged the spirit in which New South Wales had each year sent invitations to his State to be represented at conferences here, and trusted his State would reciprocate in this matter.

Improved Agricultural Methods.

For a few minutes he would like to turn to agricultural subjects. Farmers in both States were coming to the position that they would have to change their agricultural methods. In the past it had been largely extensive agriculture—and he had only respect for the men who had cleared and settled the country under the old conditions—but the increase of settlement,

reduction of areas, and greater competition were making intensive agriculture necessary. They would now have to face and climb the grade of the law of increasing returns. In other words, they would have to increase the investment per acre in order to increase the return per acre. The possibilities of this State were almost staggering. With a total of some 200,000,000 acres, and 75,000,000 acres with an average annual rainfall of over 20 inches, against a present total cultivated area of about 4,000,000 acres, he was led to ask, what would be the return when that enormous area was put to its maximum utility? The day was coming, no doubt, but the sooner it came the sooner they would be able to pay their taxes and all other charges, and to enjoy their heritage.

Well, there had been improvements in agricultural methods, but he would like to refer to the necessity for improved methods in relation to live stock farming. Farmers could not afford to copy on small farms the methods of pastoralists. They had to look after their sheep and to produce feed on which they would thrive. In South Australia farmers had been fallowing and sowing and burning the stubble, and then fallowing and sowing and burning the stubble again for years. He remembered Professor Lowrie warning them that they would exhaust the fertility of the soil, but they hardly listened to him at the time, and they continued the method for twenty years. Then Professor Lowrie's prophecy began to come true, and they had had to learn how to work their land better. They had found that after burning off the stubble they could disc in fodder crops which could be turned to account before next sowing. Mr. Clatworthy would tell them more in the afternoon of the fodder crops that could be used to best advantage under the conditions of the Parkes district, but he would like to mention that in South Australia they had proved peas to be of great value in wetter districts. Disced into the stubble they made splendid growth, and when it was realised that peas contained 20 per cent. protein while oats had only 8 per cent. they would see what fine feed peas made. The crop could be reaped with the header much the same as wheat, or it could be fed direct to sheep. It was for the agricultural experts of the State to say whether they should be grown in New South Wales, but certainly South Australians found them a fine thing.

Then if he were here he believed that even on a 20-inch rainfall with suitable soil he would try lucerne. In his State they found it went down many feet, and became so established that it withstood drought, and afforded green feed in the height of summer. They sowed the seed with the combined drill or disced in the seed in the autumn, and got excellent results from it. He submitted it was worth thinking about here for a great deal of cultivable land.

Subterranean Clover and Superphosphates.

But the greatest room for improvement, he believed, was on the non-arable land. They had found that Subterranean clover and superphosphate made a remarkable combination. Subterranean clover had been in South Australia for many years. Mr. Howard, at Mount Barker, had it for twenty years,

but it did nothing remarkable until a few years ago the idea of top-dressing with superphosphate cropped up. When Mr. Howard tried it the results were remarkable. The clover, instead of being small and thin, immediately clothed the ground so thickly that instead of walking through it one had to walk over it. Mr. L. Cowan, at Mount Barker, a few years ago had on his property poor hillside country which would only carry one sheep to 6 acres. The Subterranean clover was there, but of little use. When superphosphate was applied the carrying capacity increased amazingly, and reached six sheep to the acre. Moreover, the stock on the pasture that was not dressed were small and poor in constitution and bone, while those on the top-dressed area were large, well-grown, and thrifty. Then in the south-east there was an area of poor, hard-setting, almost worthless country that even a Government experiment farm could get but poor returns from. A neighbouring farmer tried superphosphate, the clover being already there, with the same result as in the other cases. The fact of the matter was, a whole lot of hitherto useless country in South Australia was going to carry a greatly increased number of sheep. He was most interested to see that superphosphate had already been tried on Subterranean clover in New South Wales. The experience of Mr. C. E Prell, of Crookwell, had been related in the *Agricultural Gazette* by Mr. J. N. Whittet, Agrostologist, and should be familiar to every farmer.

Subterranean clover was an annual, but it seeded abundantly, and there was no need to re-sow the ground. All it needed was a fairly long growing period and a good winter rainfall, and it would make an enormous growth for months. One farmer had run eleven sheep per acre on a 40-acre block from May to January, and then, as Mr. Kelly himself wanted some seed, at the invitation of the farmer he went along with a cart, and from an area no bigger than two tennis courts swept up twenty bran-bags of the burrs. The seeding was so prolific, in fact, that farmers were letting the harvesting of the seed at £10 per acre. That, of course, could not be a permanent phase, but at present there was a market for the seed, and the figure gave some idea of the quantity yielded and the demand for it.

As stated, it wanted a fairly long cool season. Frost did it no harm, but on country where frost was followed by quick heat it would do little good. If, on the other hand, the frost was followed by a cool spring, the clover would grow well, and provide a great quantity of feed. It should be sown in the autumn. The Department of Agriculture advised 6 lb. per acre, but that would be expensive on a large area. He would suggest sowing, say, 3 or 4 acres at that rate, cultivating the land lightly for the purpose, and then the following summer sweeping up the burr and sowing it behind a disc, or other light cultivating implement, over wider areas—"and do it before rain, not after."

The superphosphate should be applied with the seed in the first place, the quantity being determined by the quantity used with wheat.

As to top-dressing with superphosphate, that should also be as suggested by experience with wheat. In South Australia they used from 100 lb. to 150 lb. per acre, but he understood that the applications were generally lighter here. Top-dressing with a hundredweight should be done every other year, or a half-hundredweight every year might be quite satisfactory. On the large areas the superphosphate could best be applied with an old broadcaster mounted on the tail of a farm lorry. With the aid of one man, and a favourable wind, he himself treated 100 acres in one day. There was no need to buy a manure broadcaster.

It should be clearly understood that he did not recommend Subterranean clover for all conditions. He doubted if it would do in such a hot district as Parkes, with its light winter rainfall, but he felt that on the ranges from Parkes eastward, and from Cootamundra up to Tumut it would prove valuable. It would grow among rocks or rung timber, and with the broadcaster referred to, the top-dressing with superphosphate could be effected quite easily.

Replying to questions, Mr. Kelly emphasised that Subterranean clover was not a catch-crop but a permanent pasture, re-seeding itself each year. Its burrs had no hooks and would not adhere to the wool as did trefoil and similar burrs. It would smother trefoil under conditions favourable to it. As to rich river flats, he would put nothing in the world against lucerne, but on lighter, drier, and poorer country where lucerne would not grow, then he would suggest "try Subterranean."

Superphosphate he believed would improve the producing qualities of almost any land. Even among the poorest land, he knew of none that would not be benefited by that valuable fertiliser. It might not be of much advantage where only poor spear grasses grew, but wheat-farmers had for long been aware how much better was the pasture on land that had been under wheat than on land over the fence that had not been cultivated—yet no one had ever thought of connecting that improvement with the superphosphate used on the wheat.

The vote of thanks accorded Mr. Kelly for his address was a particularly hearty one.

Country Telephones in Norway.

Owing to the great extent of the country and its mountainous conformation, the means of communication in Norway by road or railway are, in many districts, far from satisfactory. As a set-off to this, says a departmental publication, the use of the telephone has developed to an extent that is probably unparalleled in any other country. In most of the rural districts the great majority of the farmers and artisans, and, in fact, even some of the farm labourers, have this means of communication.

Spread of Co-operation.

The Registrar of Co-operative Societies reports an increasing practical interest in co-operation in New South Wales, and the beginnings of an extensive rural co-operative development are widely apparent. Such a growth must inevitably be slow if it is to be sure, for the soundest and most durable co-operative organisations have been found by experience to be those which have been well considered and carefully constructed, following good models. It is, therefore, a favourable augury for the future of co-operation that instead of a spectacular increase in the number of societies there has been a sustained growth which inspires confidence in co-operative principles.

In the five years preceding 1924 the average annual number of co-operative societies registered was 13. In 1924 there were registered 20 new societies and for a period of less than three months in 1925 six were registered. These figures exclude companies reconstructed as co-operative societies. The greater part of the increase has been due to the formation of rural co-operative societies, twelve of the societies registered in 1924 and three registered in 1925 being of this class. But beyond this growth of registered co-operative organisations, quiet trading activity of a co-operative nature is steadily increasing among men on the land. Pool buying, joint consignment of produce, organisation for the sale of produce direct to the consumer, the construction of group sheep dips, the joint purchase of utilities such as machines or vehicles, and kindred activities are all becoming more and more popular. Success achieved by one little organisation is usually imitated by others and so the benefit is distributed. This is excellently exemplified in the increase of group sheep dips. Thus, in many ways, the primary producer is learning the practical advantages of co-operation, and is gaining experience in the conduct and control of co-operative business ventures which will be of inestimable value when it is decided to embark on large-scale co-operative undertakings.

The success of co-operative organisation is being exemplified on many sides. It is being recognised that by this means farmers obtain greater bargaining power in their business dealings, and the use of utilities on their farms which they could not obtain by their individual efforts. But perhaps the most significant recent development has been of an international character, the Co-operative Wholesale Society of Great Britain having arranged to finance the Co-operative Wheat Pool of West Australia, and to provide an advance of 3s. 6d. per bushel at country sidings without any Government guarantee. The continuance of this arrangement is contemplated for future seasons, so long as the pool continues.

With a view to establishing good relationships between consumers' and producers' co-operative organisations in New South Wales, a conference was held under the auspices of the Government on 20th April, and it was felt that a stimulus was given to direct trading between the organisations of producers and consumers to their mutual advantage.

An article on the Co-operation, Community Settlement, and Credit Act appeared in this *Gazette* for September, 1924, and another on "How to Form a Co-operative Society in New South Wales", which has since been issued in pamphlet form, was published in the issue of January, 1925. Copies of pamphlets and model rules, and any information desired, may be obtained free by application to the Registrar of Co-operative Societies, 36 Young Street, Sydney, and when the formation of a society is contemplated the services of the Information Officer may also be obtained.

Farmers' Experiment Plots.

WHEAT AND OAT EXPERIMENTS, 1924.

Central Western District.

W. D. KERLE, H.D.A., Senior Agricultural Instructor.

CEREAL experiments were conducted during the 1924 season by the following farmers in co-operation with the Department:—

C. Carter, "Kikiamah," Grenfell.
Y. H. Walker, "Yamboola," Eugowra.
V. D. Cox, "Burrundulla," Mudgee.
Robinson Bros., "Tallawang," Gulgong.
M. F. Dalton, "Duntry League," Orange.
Wm. Burns, "Goongirwarrie," Carcoar.
A. Rowlands, "The Pines," Neville.
G. L. McLaren, "Locksley," Cumnock.
J. J. Grant, "Sarilla," Shaw.

Comparable results were not obtainable from the trials at Neville, Cumnock, and Shaw, owing in the first case to frost blight in early December, in the second to heavy hail damage, and in the last to lodging and tangling. In each instance the growth was heavy and the prospective yield at flowering time very high.

Cultural Details.

Grenfell.—Light red loam; old cultivation paddock out two years grazing previous to fallowing with mouldboard end of September. Springtoothed end March and harrowed before sowing. Fallow grew very little weed. Sheep kept on continuously up to March. Sown 6th and 7th May with 50 lb. graded seed (treated with dry copper carbonate) and 50 lb. superphosphate per acre.

Eugowra.—Light red loam; fallowed end March, 1923, with one-way disc; springtoothed June and September, one-wayed January, harrowed March, and sown with combine 7th and 8th May, with 52 lb. graded seed (copper carbonate treated) and 50 lb. superphosphate per acre. Sheep continuously on the fallows, which carried a fair amount of *Eragrostis major*. The ground was somewhat caked and weedy at sowing, but the seed was put in satisfactorily with a combined drill and cultivator.

Mudgee.—Red loam soil; disc-ploughed February, springtoothed April, and sown 25th and 26th April with seed (graded and treated with dry copper carbonate) at 50 lb. and superphosphate at 60 lb. per acre. Soil in excellent tilth at sowing time.

Tallawang.—Red loam; previous crop winter fodders. Ploughed 27th and 28th September, springtoothed 12th and 13th March, harrowed 17th and 18th April, and sown 17th May with graded seed (copper carbonate

treated) at 58 lb. and superphosphate at 50 lb. per acre. The land was kept bare of weeds with sheep. The soil at sowing time was carrying a fair amount of moisture and had a nice cloddy surface.

Orange.—Grey to red clay loam, stony; previous crop winter fodders, fed off late in the year. Mouldboard-ploughed 25th February, harrowed 29th, springtoothed early March, harrowed and rolled early April to break up clods, and sown 14th April with graded seed at the rate of 55 lb. and superphosphate at 60 lb. per acre. Crop fed off in June.

Carcoar.—Grey loam; previous crop potatoes in rotation of (1) winter fodders, (2) potatoes, and (3) wheat for hay. Potatoes harvested late in May; ground ploughed and harrowed and wheat sown 14th June, at the rate of 65 lb. seed and 50 lb. superphosphate per acre. Sorrel was bad in portion of the paddock.

The Plot of Major at Mr. Y. H. Walker's Farm, Eugowra.
Yield, 39 bus. 30 lb.

Neville.—Light red loam soil; fallowed with mouldboard plough 6 inches deep first week in November, harrowed 2nd February, one-wayed mid-March, springtoothed in front of drill. Seed (graded and copper carbonate treated) at the rate of 60 lb., with superphosphate at 50 lb. per acre. Soil in excellent condition at sowing time.

Cumnock.—Soil red to grey clay loam, undulating; previous crop wheat. Fallowed August and September, harrowed November and December, springtoothed March, harrowed April, and sown 6th and 7th May with seed (graded and treated with dry copper carbonate) at the rate of 55 lb. and superphosphate at 50 lb. per acre.

Shaw.—Red soil; previous crop potatoes, harvested September. Reploughed January, springtoothed early March and end April. Oats sown 1st May with 50 lb graded seed and 60 lb. superphosphate per acre

The Season.

The rainfall recorded at each centre where yields were obtained (1) from time of first cultivation to sowing, and (2) during growth of the crop was as follows:—

Locality.	Grenfell.	Eugowra.	Mudgee.	Tallawang.	Orange.	Carcoar.
Rainfall from first cultivation to sowing	inches. 17·46 (Sep.-Apl.)	inches. 20·70 (Mar., 1923-Apl., 1924.)	inches. 4 57 (Feb.-Apl.)	inches. 12·28 (Oct.-Apl.)	inches. ·70 (Mar.-Apl.)	inches. 1·70 (June).
1924.						
April ...	......	......	......	.....	2·00	......
May ...	·88	·33	1·25	·10	1·37	......
June ...	2·43	2·12	1·65	1·48	3·14	·78
July ...	2·15	2·24	1·50	1·42	2·46	1·55
August ...	3 82	1·91	2·26	1·98	2·73	2·51
September ...	3·27	4·44	3·24	4·26	6·75	3·43
October ...	1·58	1·06	1·73	1·83	2·55	1·92
November ...	7·10	6·02	9 32	6·76	6·02	6·38
Total ...	21·23	18·12	20·95	17·83	27·02	16·57

The season commenced under excellent circumstances, good summer rains permitting the requisite cultivations to get the soil into good tilth for sowing. At sowing time the soil was in good condition as regards moisture, and in good physical condition, occasionally somewhat dirty with *Eragrostis major*, which had made exceptional growth owing to plentiful summer rains. The rainfall in the winter months was not excessive, but in some localities frosts were severe—at Carcoar, for example, where in June-July twenty-three consecutive frosts were experienced, and most of them very heavy. The September rains were above the average, and the wheat made great headway. October was dry in comparison, but in November heavy rain and wind storms, accompanied in many instances by hail, played havoc with the dense tall-growing crops, causing considerable lodging and tangling, much hail damage, and providing suitable conditions for the development of fungous diseases. The harvest was a long and difficult one, and much grain was lost or pinched as a result of lodging, and in many localities was badly bleached. Rain during the hay harvest impaired the quality of chaff considerably.

On 2nd December a heavy frost was experienced in the Neville-Blaney district, and also at Orange and Bathurst, but not so heavy. At this stage the wheat experiments at Neville were at the flowering to half-formed grain stage, dense and even, and promising yields of 40 to 45 bushels per acre. The frosts, however, completely destroyed the grain, the ears becoming dry and more or less shrivelled, though retaining their natural greenness. The crops throughout the district, although intended for grain, had all to be cut for hay. In the Cumnock district heavy hail-storms were experienced,

and the experiments in that locality were badly knocked out at the end of November, the crop at the time being dense, evenly headed, and promising seven to nine bags to the acre.

RESULTS of Wheat Variety Trials (Grain).

Variety.	Grenfell.	Eugowra.	Tallawang.	Mudgee.
	bus. lb	bus. lb.	bus. lb.	bus. lb.
Wandilla	42 12	37 24	34 0	19 17
Currawa	37 25	30 27	32 38	20 28
Marshall's No. 3	37 3	....	....	......
Queen Fan	37 1	....	29 10	18 13
Waratah	36 38	43 20	.. ..	21 22
Gresley	36 27	40 8	33 6	17 30
Onas...	34 21	....	....	19 21
Canberra	31 17	37 18	38 40	19 42
Hard Federation	29 6	34 40	30 58	17 42
Duri	....	40 57	....	.....
Major	....	39 30	... .	......
Yandilla King	....	36 52	....	20 17
Federation	....	31 50	....	.....
Cleveland	....	....	35 35	25 37
Minister	....	....	35 50	......
Aussie	....	....	35 10	.....
Union	......	. ...	33 22	22 40

RESULTS of Hay Trials.

Variety.	Carcoar.	Orange.	Variety.	Carcoar.	Orange.
Wheat—	t. c. q. lb.	t. c. q. lb.	Wheat—	t. c. q. lb.	t. c. q. lb.
Cleveland ..	3 18 1 14	3 8 1 0	Yandilla King	1 13 1 14	.....
Gresley ...	3 5 2 8	1 8 2 0	Firbank ...	......	3 2 0 20
Wandilla ...	2 11 0 0	......	Oats—		
Currawa ...	2 8 0 0	......	Ruakura ..	......	3 4 1 15
Onas	2 5 0 15	......	Algerian ..	......	2 18 1 0
Canimbla ...	1 16 1 0	......	Sunrise ...	......	2 14 2 0
Marshall's No. 3	1 14 2 0	......			

RESULTS of Manurial Trials.

Robinson Bros, *Tallawang* (Canberra).

	bush.	lb.
Superphosphate, 50 lb.	38	40
No manure	36	9

Wm. Burns, *Carcoar* (Cleveland).

	t.	c.	q.	lb.
Superphosphate, 56 lb.	3	18	1	14
No manure	2	11	2	7

The Prevalence of Diseases.

Practically all the fungous diseases which attack wheat in this State were in evidence last season. In the denser crops in some localities mildew (*Erysiphe graminis*) made its appearance in November, but did not develop to any extent. Rust developed with the advent of moist conditions and reduced the yield of susceptible varieties, Federation in particular. Loose smut was very prevalent in some localities, and on Canberra in particular. This disease is undoubtedly becoming worse each year, and should no longer

be regarded with indifference. Flag smut was noticeable in most localities, but not to anything like the extent of the previous two seasons. Bunt was only present where defective preventive measures were adopted. The dry copper carbonate process proved to be much superior to bluestone, seed so

The Plot of Wandilla at Eugowra.
Yield, 37 bus. 24 lb.

Members of the Neville Branch of the Agricultural Bureau, viewing the Plots at Mr. A. Rowland's Farm.
Frost on 2nd December ruined these plots for grain.

treated germinating much better and producing plants of greater vitality, while the process proved equally efficacious in preventing bunt.

Leaf spot (*Septoria tritici*) was prevalent in most localities, and was responsible for much of the pinched grain and depleted yields. Foot-rot and take-all were probably more prevalent this season than in the drier ones experienced in the previous four years.

The Behaviour of Varieties.

The highest yield in these experiments was from Waratah, which also did well at all centres. It was the outstanding variety in crop-growing competitions in the central-west this season, and bids fair to become a standard for the district. Cleveland yielded exceptionally well at Mudgee and Tallawang. Duri showed considerable variation in type and straw weakness, but yielded over 40 bushels at Eugowra. Wandilla gave the highest yield at Grenfell, and promises well for early to midseason sowing in the central west.

Canberra and Minister gave very excellent returns at Tallawang, where the yields were much above the district average. Aussie and Union have also both yielded well at this centre in the last two seasons.

The season showed the varieties with straw weakness, and Canberra was particularly badly lodged and tangled. The varieties under trial showing the greatest strength of straw were Federation, Hard Federation, Union, Cleveland, Major, and Currawa.

Comments.

The yields obtained this season are above the average, owing in a measure to the favourable conditions. There are certain factors, however, which make for satisfactory yields, whatever the season may be. Field experiments and growing-crop competitions have demonstrated that the main factors which contribute to success are to—

1. Fallow early, and work the fallows judiciously.
2. Select the right varieties, and sow them in their right season.
3. Use pure graded seed, and treat it for bunt by the dry copper carbonate process.
4. Use superphosphate, ascertaining by experiment the right quantity to apply on the individual farm.

Western District (Dubbo Centre).

B. M. ARTHUR, H.D.A., Agricultural Instructor.

The following farmers co-operated with the Department in conducting cereal experiments during the season 1924:—

A. H. Newton, "Yarrandale," Armatree.
J. Parslow, "Kelvin Grove," Gilgandra.
V. J. Buchan, "Eurramalong," Dubbo.
L. Clark, "Dulcidene," Dubbo.
C. J. Harvey, "Enterprise," Rawsonville.
J. Mason, "Quambi," Narromine.
Everett and Quirk, "Narrawa," Wellington.
S. Reilly, jun., Eurimbla, *via* Cumnock.
H. E. Crane, "Glenmore," Coonabarabran.
H. B. Loveband, "Blenheim," Coonabarabran.
L. C. J. Broughton, "Berrima," Mendooran.
V. Granowski, "Mooren," Binnaway.
D. McMaster, "Kurrajong Park," Coolah.

The Season.

Once again fortune has smiled upon the West with a return to a satisfactory wheat-growing season. The yields for the district have been much above the average, and would probably have been considerably larger,

had it not been for the heavy rains and winds in November. Coming when the majority of the crops were ripening, these did a considerable amount of damage in lodging them, and bleaching and pinching the grain.

Substantial falls were recorded on the fallows during the latter months of 1923, and were made good use of by cultivation and the aid of sheep, but the early part of 1924 was particularly dry, preventing the working of fallows to any extent. Good, though light rains during April, aggregating from 1 to 3 inches, enabled early seeding to commence, but a dry May caused a certain percentage of seed to malt in the ground, causing patchy germination. In certain localities, too, grasshoppers were plentiful, eating off and killing the young growth, and necessitating the re-seeding of many areas. Excellent rains received early in June removed all doubt in regard to a successful germination of May-sown crops, and from then until October just sufficient rain was received in most localities to keep the crops sown on fallowed land moving along nicely without any undue check to their growth. Sowings on stubble land, on the other hand, received more than one check in this respect, due to short dry periods.

In November, just when the majority of the crops were promising to fill the ears with plump grain, and all of them were standing up well, heavy rains, spread over a week, and aggregating from 6 to 9 inches in various parts of the district, and accompanied by strong winds from varying directions, caused considerable havoc by lodging and tangling the crops, and in certain low-lying localities by inundating them, resulting in lessened yields due to bleached and pinched grain, shelling, presence of rust, &c. They presented, moreover, many difficulties in harvesting, which were mostly surmounted, however, by the use of false combs on the headers.

RAINFALL during Fallow and Growing Periods.

Locality.	Growing Period.								Total for Growing period.	Total Rain on fallow.
	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.		
	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.
Dubbo (L. Clark) ...	22	228	163	115	372	138	794	...	1,832	954
Dubbo (C. J. Harvey) ...	28	227	176	121	394	176	767	...	1,889	610
Dubbo (V. J. Buchan) ...	27	301	139	102	471	135	748	...	1,923	981
Armatree	8	129	169	54	337	241	727	...	1,665	1,476
Gilgandra	56	186	185	160	353	197	639	...	1,776	1,284
Narromine	49	258	249	89	276	140	620	...	1,681	721
Wellington	63	101	228	125	364	191	738	...	1,810	1,181
Eurimbla	93	214	282	139	403	147	656	...	1,934	*
Mendooran	118	25	155	203	221	347	573	...	1,642	*
Binnaway...	Nil.	73	155	95	293	233	540	...	1,389	*
Coonabarabran (H. B. Loveband).	...	130	190	140	296	156	813	36	1,769	*
Coonabarabran (H. E. Crane).	24	202	255	120	398	282	993	...	2,274	*

* Not available.

Cultural Details.

Armatree.—Red sandy loam; previous crop wheat, 1922, no manure. Mouldboard-ploughed July, disced October, harrowed November, disced January to deal with paddy-melons, harrowed March, springtoothed May, and sown 14th and 15th May with the hoe drill, using 45 lb. graded seed, and 52 lb. superphosphate per acre. The seed-bed was in good order; it was harrowed after sowing. Germination was good, and results were satisfactory. Late-maturing varieties, particularly Wandilla, showed to best advantage.

Gilgandra.—Variable black clay to sandy loam of volcanic origin; previous crop winter fodders, 1923, sown with 56 lb. superphosphate, and fed off with horses and sheep. Mouldboard-ploughed 15th September, springtoothed October, again in September and November, disced January in order to kill couch grass, harrowed January, disced April for couch grass, and harrowed May. Sheep were also run on the fallow at intervals. Sown 14th May with disc drill, using 50 lb. graded seed, and 50 lb. superphosphate per acre, and harrowed after sowing.

The ground was in excellent order for sowing, containing sufficient moisture for immediate germination, which was good. The yields were very good, particularly of Wandilla, Bena, and Waratah.

The oat variety trial was sown on black clay loam which had previously been cropped with wheat, 1922 (no manure). It was mouldboard-ploughed July, springtoothed August, disced September, springtoothed October, disced January, and again in April, to kill paddy-melons, and sown on 15th May with 52 lb. seed and 50 lb. superphosphate per acre. The germination and early growth was very promising, but the heavy November rains badly damaged the Guyra and Mulga plots, which were practically ready to strip, and a considerable portion of the crop was lost by lodging and shelling. Considering the damage done, the yields were good, though not strictly comparable.

Wellington.—Rich chocolate loam of a self-mulching character with clay subsoil; previous crop wheat, 1922 (no manure), which had failed and been fed off with sheep. Mouldboard-ploughed end August, 1923, 4 inches deep, harrowed November, fed off till February, disc-cultivated and harrowed February. Sheep again used till May; harrowed 3rd May, springtoothed 15th May, and sown on 16th and 17th May with disc drill, using 52 lb. seed and 56 lb. superphosphate per acre. There was sufficient moisture in the fallow to ensure an excellent and immediate germination. Harrowed after drill. The germination and growth throughout was good on these plots, which were also absolutely weed free.

The heavy November rains lodged the crops somewhat, but not sufficiently to materially interfere with the harvesting. Flag smut was rather prominent in the Canberra, and loose smut prevalent in the Currawa and Canberra. The Federation was slightly affected with rust and powdery mildew. Th

yields were uniformly good, particularly those of Yandilla King, Canberra, and Gresley. The oat variety trials yielded well, the early-maturing varieties showing to the best advantage.

Narromine.—Red clay loam with variable light sandy and gilgai pockets; previous crop wheat, 1922, manured with 45 lb. superphosphate. Mouldboard-ploughed July, springtoothed January, and again in mid-May, during which period sheep were run on the fallow. Sown 24th and 26th May after 33 points of rain, using a combine drill, sowing 48 lb. wheat and 70 lb. oats, together with 45 lb. superphosphate per acre.

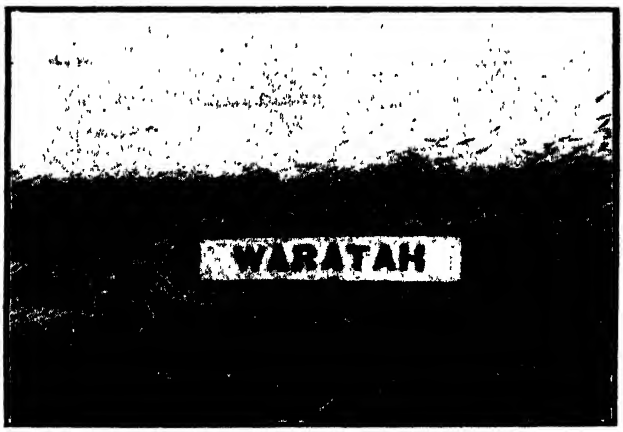
The germination was excellent, and except in the oat plots, which were sown too thick owing to the absence of a chart on the drill, the progress made during the early stages of growth could not have been better. The heavy November rains did a considerable amount of damage, particularly to the Gresley, which showed weakness in the straw, and to Federation, which was attacked with rust. Sunrise oats also lodged badly, and at least half could not be harvested. Guyra oats stood up to the storms well, and gave an excellent yield.

Dubbo (C. J. Harvey).—Red clay loam, typical of box and pine wheat country; previous crop oat variety trial, 1922 (no manure). Disc-ploughed December, 1923, harrowed December, again in February, springtoothed mid-May, sown 19th May, with combine drill using 50 lb. seed and 50 superphosphate per acre. At time of sowing there was moisture in the subsoil, but not sufficient to germinate the seed properly, so the seed was sown shallow in a dry mulch so as to avoid any possibility of a percentage of it malting. Germination after the early June rains was good, and the yields obtained were uniformly good, particularly those of the newer varieties—Aussie, Wandilla, and Union. The manured plot gave an increased yield of 7 bushels 22 lb. over the unmanured.

Dubbo (V. J. Buchan).—Red sandy loam; previous crop, wheat, 1922 (no manure). Mouldboard-ploughed August, harrowed September, again November, springtoothed December, disced January in order to kill couch grass, and harrowed afterwards, disc-harrowed May. Sheep were also run on the fallow at intervals. Sown 10th May, with 50 lb. seed and 60 lb. superphosphate per acre, using a disc drill with harrows attached. Germination and general stooling and growth was good throughout, and big yields were anticipated, but the heavy November rains caused a flooding of the plots diagonally across the paddock, affecting particularly the Yandilla King, Riverina, and Federation plots, and the others to a lesser extent. The flooding also delayed harvesting, and the rapid growth of black thistles and wild turnip, together with the lodging of the crops made harvesting a particularly difficult proposition. Considering these difficulties, the yields are surprisingly good. The accompanying photographs, taken before and after the November rains, give a good idea of the damage done.

Dubbo (L. Clark).—Light red loam; previous crop wheat, 1922, manured with 45 lb. superphosphate. Disc-ploughed July, springtoothed September, sheep run till January, when the fallow was springtoothed, disced March, springtoothed April, harrowed mid-May. Sown 27th May, with light harrows trailing, with 52 lb. seed and 56 lb. superphosphate per acre. The

Plot of Waratah at Dubbo before the rain.
Height, 4 feet 6 inches



The same Plot after the rain.

germination of these plots was very patchy owing to damage to seed by contact during transit by rail with sulphuric acid, which apparently killed or impaired the vitality of many grains. Towards harvest time, too, what appeared to be a perfect fallow at seeding was found to be alive with star thistles, which over-ran the plots, causing great difficulty in harvesting, especially after the delay occasioned by 8 inches rain in November. The unmanured plot of Federation was a failure, being of insufficient height to

strip and a mass of star thistles. A manurial trial with Hard Federation was also conducted, and here again the no-manure plot failed. The oat trials were primarily intended to be harvested for grain, but were so lodged and tangled by rain and wind that they were cut for hay and the hay weights obtained for comparison.

Eurimbla.—Red clay loam, limestone formation; previous crop wheat, 1922 (no manure). Mouldboard-ploughed 4½ inches deep September, springtoothed end November, mouldboard-ploughed late April, harrowed May, sown 5th and 6th May with disc drill, using 50 lb. seed and 56 lb. superphosphate per acre. Germination was good throughout, though the seeding could have been heavier with safety. The oat plots were severely knocked about by the November storms, particularly Sunrise, which shelled badly.

Plot of Riverina at Dubbo.

Though knocked down by rain and flood water, it stripped 21 bus. 21 lb.

Binnaway.—Black to chocolate alluvial soil; previous crop wheat, 1923 (no manure). The land which had been fallowed for these plots could not be got into a satisfactory condition owing to a heavy growth of Mexican poppies and stink grass, and other weeds, and the plots were therefore sown on stubble land which was ploughed in March, and springtoothed in front of the drill 4 inches deep. Sown 27th May with 60 lb. seed and 65 lb. superphosphate per acre. *Eragrostis major* was troublesome, continually choking the drill. Very little moisture was present and germination was very patchy and poor. Little rain fell in June, and it was not till July that a good soaking rain was received. These plots were also struck by a hailstorm, which, together with the other factors before mentioned, caused the yields to be very disappointing.

Mendooran.—Medium to heavy sandy red loam; virgin ground, fallowed 1923. Sown 22nd to 24th May with 60 lb. seed and 56 lb. superphosphate. The soil was in fair condition, containing sufficient moisture to germinate the seed, but it was patchy. Germination and growth were good, and the

yields obtained were very satisfactory for this locality on new ground, particularly that of Canberra, Waratah, and Hard Federation. The application of 56 lb. superphosphate doubled the yield at this centre in the manure *versus* no-manure plots.

Coonabarabran (H. E. Crane).—Red to grey sandy loam of variable quality; Previous crop wheat, 1922 (no manure). Disc-ploughed March, 1923, harrowed September, reploughed early September and again in April, spring toothed and harrowed 10th May, sown 13th to 14th May with 60 lb. seed and 56 lb. superphosphate per acre, a tractor being used for this work. A manurial trial was also conducted here (see remarks under subsequent heading).

Coonabarabran (H. B. Loveband).—A very variable red clay to sandy loam soil on bank of creek; previous crop winter fodders, 1923, sown with 50 lb. superphosphate. Residue ploughed under October, 1923, and land worked many times to kill couch grass, which was bad. Owing to couch grass portion of the area was not fit to be sown; consequently some of the plots had to be sown elsewhere, Hard Federation being used as a check. Sown 28th and 29th May with 68 lb. seed and 50 lb. superphosphate per acre. Sufficient moisture was present to ensure a good germination.

The System of Rotation.

A three-year rotation consisting of wheat, oats and winter fodders—sown early, fed off, and the residue ploughed under during August or September in order to sow wheat the following year—was instituted a few years ago in this district, but in most localities it has been found impracticable to adhere strictly to this rotation owing to the abnormal seasons experienced during the past three years, when it has been impossible to obtain a satisfactory germination of the winter fodders before June. Consequently sufficient feed value could not be obtained from them before it was necessary to plough the residue under in order to prepare the fallow for the following season's wheat variety trials. Further, a number of the areas specially set apart for this rotation became over-run with weed growth (black oats, mustard, thistles, &c.), and the dry summers and autumns precluded any possibility of cleaning them up satisfactorily by cultivation and the aid of sheep. Winter fodders were sown, however, this season at Eurimbla, Gilgandra, and Coonabarabran. The results will be published in a separate report.

Notes on Varieties.

The outstanding variety in this season's trials is undoubtedly Wandilla (Federation x Yandilla King). It gave the highest yields at Armatree, Gilgandra, and Eurimbla, and also yielded consistently at all other centres where tried. Waratah was also a consistent yielder. This variety is likely to prove very popular, and to take the place of Canberra, as it is somewhat stronger in the straw and apparently not so liable to diseases such as flag smut, loose smut, &c. Canberra, however, still continues to maintain its reputation as a bag filler, in spite of its many disabilities.

New varieties to the west in Union, Riverina, and Aussie have also done well in this their first year of trial, but cannot be recommended until they have been given a further try-out.

Bena, supposedly a natural cross between Hard Federation and Marshall's No. 3, was tried out at Gilgandra, and did well, giving the second highest yield. It is a promising variety in its characteristics of growth.

Diseases.

Fungous diseases of the wheat plant were not present in the plots to any great extent. All the seed was treated by dusting with dry copper carbonate, and this treatment is undoubtedly effective in controlling bunt or stinking smut, as no trace of it was found anywhere. The germination was also much better and quicker than was the case formerly when the bluestone and lime treatment was used.

Flag smut was present in a few localities, but did not do any serious damage. Loose smut (particularly in Canberra and Currawa) was more prevalent than usual. Foot-rot and take-all were not noticed, but powdery mildew and leaf blight (*Septoria*) did a certain amount of damage, particularly to varieties of Federation parentage.

RESULTS of Variety Trials (Oats).

Variety.	Armatree.		Gilgandra.		Wellington.		Eurimbla.		Narromine.		Dubbo (L. Clark).		
	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	t.	c.	qr.
Algerian	35	24	35	7	43	11	38	0	26	15	2	1	15
Sunrise	30	8	...		49	0	32	30	16	36	*2	2	13
Mulga	23	37	25	2	53	1	57	0	...		...		
Guyra	...		34	2	...		62	20	41	10	...		
Lachlan	...		...		...		49	20	...		...		

* These plots had to be cut for hay owing to severe lodging due to heavy November rains. All the oat plots were more or less damaged by these rains, particularly the early-maturing varieties, Mulga and Sunrise.

Fertiliser Trials.

A manurial trial was incorporated with the wheat experiments, one variety in each case being divided into two plots, one manured with an average amount of 56 lb. superphosphate and the other unmanured. With two exceptions, the manured area gave payable increases, particularly at Mendooran, Coonabarabran, and Dubbo (three centres). At Wellington there was a slight decrease, possibly due to some chemical element in the soil (which in this locality contains a large proportion of iron) neutralising the phosphoric acid in the superphosphate, or creating chemical compounds which are not immediately available as plant-food.

In addition tests were made at Dubbo (L. Clark) with varying amounts of superphosphate, both the ordinary 36–38 per cent. and high grade 45 per cent. being used. The heavier dressings (102 lb.) of 36–38 per cent. and

Results of Variety Trials (Wheat).

Variety.	Armatree.	Gilgandra.	Dubbo (W. J. Buchan).	Dubbo (C. J. Harvey).	Dubbo (L. Clark).	Wellington (W. T. Everett).	Eurimbla (S. Reilly, jun.).	Narromine (J. Mason).	Coonabarabran (H. B. Loveband).	Coonabarabran (H. E. Crane).	Binnaway (V. Granowski).	Mendooran (L. C. J. Broughton).
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus lb
Canberra	22 36	29 34	29 6	25 46	15 50	35 49	38 0	26 19	27 48	29 30	4 30	27 45
Federation	23 4	...	25 10	22 23	13 54	32 55	30 0	17 2	...	...	...	...
Hard Federation	...	30 22	...	...	...	...	...	...	28 30	17 30	5 30	27 15
Yandilla King	...	...	23 32	28 18	20 30	36 46	37 0	24 21	22 30	21 30	6 0	23 45
Wandilla	27 1	39 48	25 26	26 45	...	...	39 30	...	25 0	23 0	7 45	...
Waratah	22 0	32 1	28 22	...	18 13	...	...	23 8	23 20	...	6 15	30 0
Riverina	24 42	...	21 21	...	...	...	32 30	...	...	...	10 15	...
Florence	...	30 33	20 21	...	...	29 4	...	...	...	...	...	23 30
Union	...	...	...	25 48	...	...	34 30	...	24 20	...	...	...
Aussie	...	...	...	28 8	19 48	...	...	...	...	...	...	...
Gresley	23 18	...	...	...	...	34 23	40 0	22 9	34 8	19 30	6 15	21 45
Currawa	...	...	...	...	...	33 20	...	19 27	...	17 30	...	23 30
Clarendon	...	27 44	...	...	13 19	...	...	24 37	...	...	5 0	...
Bena	...	33 19	...	...	...	...	...	...	...	...	...	...
Firbank	...	...	...	...	16 4	26 41	...	...	...	...	...	20 0
Cleveland	...	...	...	...	...	...	...	...	28 15	...	...	...
Major	...	...	...	...	...	...	...	...	21 0	...	...	...
Canimbla	...	...	...	...	...	...	...	...	20 45	...	...	...
Early Bird	...	...	...	...	...	...	...	...	...	...	5 15	23 45
Onas	...	...	...	...	...	...	...	...	...	...	7 0	...
Queen Fan	...	...	...	...	...	...	...	...	...	...	...	25 0

50 lb. of 45 per cent. gave increases on the return from 50 lb of ordinary superphosphate. The no-manure plot totally failed, being not high enough to strip, and over-run with star thistles. At Coonabarabran (H. E. Crane) a manurial trial with composite fertilisers was conducted. Here, again, superphosphate alone gave a higher yield than the more expensive composite manures containing varying percentages of bonedust, sulphate of ammonia, and potash in conjunction with superphosphate. Farmers would therefore be ill-advised to go beyond superphosphate in the commercial production of wheat for grain.

RESULTS of Fertiliser Trials.

	Armatree.	Gilgandra.	Dubbo (V. J. Buchan).	Dubbo (C. J. Harvey).	Dubbo (L. Clark).	Wellington.
Variety	Canberra.	Canberra.	Canberra.	Canberra.	Federation	Canberra.
	lb.	lb.	lb.	lb.	lb.	lb.
Superphosphate, per acre ...	52	50	60	50	56	56
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Yield from manured section ...	22 36	29 34	29 6	25 46	13 54	33 59
Yield from unmanured section	20 25	28 0	22 49	18 24	(failed)	35 49
Increase	1 38	1 34	6 17	7 22	13 54	...
Decrease	...	...	...	...	...	1 50

	Narromine.	Eurimbla.	Coonabarabran (H. E. Crane).	Binnaway	Mendooran.
Variety	Canberra.	Canberra.	Canberra.	Hard Fed.	Hard Fed.
	lb.	lb.	lb.	lb.	lb.
Superphosphate, per acre ...	56	56	56	65	56
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Yield from manured section ...	26 19	38 0	29 30	5 30	27 15
Yield from unmanured section	25 8	29 0	16 0	3 45	13 45
Increase	1 11	9 0	13 30	1 45	13 30
Decrease	...	...	...	...	...

Fertiliser per acre.	Dubbo (L. Clark).	Coonabarabran (H. E. Crane).
	bus. lb.	bus. lb.
36–38 per cent. superphosphate: 50 lb.	12 32	......
36–38 " " 102 lb.	16 33	......
45 " " 50 lb.	16 44	......
* M5: 56 lb.	......	23 30
* M9: 56 lb.	......	27 30
* P7: 56 lb.	......	23 15

* M5 consists of 2 parts superphosphate and 1 part sulphate of ammonia; M9 of superphosphate 1½ parts, bonedust 1½ parts, chloride of potash 2 parts: P7 of equal parts superphosphate and bonedust.

Fat Lambs and Fodder Crops.

A Paper and a Discussion at Parkes Bureau Conference.

Readers of the *Agricultural Gazette* will remember the great interest aroused by the paper read by Mr. J. Clatworthy and the address given by Mr. J. B. Cramsie at the Agricultural Bureau Conference at Parkes in April, 1924. Both gentlemen had before them the raising of fat lambs, and both succeeded in adding materially to the knowledge of farmers on the subject.

This year the subject of fat lambs was again a prominent feature of the Parkes Conference, Mr. Clatworthy devoting himself more particularly to the question of fodder crops for the purpose. This time he was followed by the Hon. A. G. Manning, Chairman of the Australian Meat Council, and others with actual experience in the business, and the session was again a highly important and interesting one.—Ed.

THE GROWING OF FODDER CROPS IN THE WHEAT BELT.

J. CLATWORTHY, "Beechmore," Parkes.

In all branches of farming and stock-raising new methods and ideas are ever coming to the fore, and as regards fat lamb raising we have reached the stage when the growing of fodder crops must be considered a necessary and essential part of the general farm practice. My paper read at last year's conference did not touch on this phase of the question. In the temperate portion and on the highlands a variety of fodder crops can be grown, the conditions there conforming more closely to those of New Zealand, but in the drier and more extensive area of the wheat belt the choice is necessarily limited. Lucerne is the crop par excellence where the soil and conditions are favourable, as, for instance, the valley of the Lachlan, where there is room for extensive planting, but away from the rivers the typical wheat land is unsuitable for lucerne. Rape has been tried in our locality with but indifferent results. Sudan grass has proved a disappointment; in dry years the germination and growth are poor, and in good seasons sheep prefer almost anything else growing in the paddock. As an example of this, my neighbour, Mr. W. E. Tayler, "Adavale," in September last planted an area of 70 acres Sudan grass with "super," on a portion of a paddock of well prepared fallow. As usual the germination was poor but the season being favourable, rapid growth resulted. Ewes and lambs were turned into the paddock and roamed all over it, grazing on the fallow and headlands, but avoiding the Sudan grass, which appeared then to be at a very succulent stage. They were replaced later by dry sheep with little better results; the Sudan grass made luxuriant growth and was later converted into stack silage. As fallow the portion was virtually ruined and the object of

fattening lambs was not attained. Both Cape and Skinless barley, especially in rich soil, yield an abundance of fodder but have the disadvantage of being subject to the same disease as wheat. Oats is my recommendation as a rotation crop with resulting benefits to the wheat-farmer and for fat lamb raising and the conservation of fodder.

The past season should certainly point the danger signal to the wheat-grower, for the prevalence of foot-rot, take-all, flag smut and other diseases was alarming. There were a series of scares in our district, yet a number of farmers are preparing to sow trouble by again planting these paddocks with wheat. Yet one cannot altogether blame the men on too small holdings for making a gamble of wheat-growing, by each season placing all their available land under wheat. I would like to put in a plea for the soldier settlers, who, if given an area of 800 acres as a minimum, would have the opportunity of making good. This area would allow each year of 200 acres wheat sown on fallow, 100 acres oats for grazing and conservation of fodder, and 200 acres fallow, with 300 acres grazing land; this would enable the farmer to carry 300 to 400 ewes for rearing fat lambs, assuring a return from both wheat and sheep. Just when the wheat-grower was congratulating himself that, by improved methods of fallowing, better varieties of wheat, grading, pickling and improved machinery, all was well, then Dame Nature as a set off supplied a number of fungous diseases compared with which our old rival black oats was a gentleman. Evidently the ancients knew a thing or two, as shown by a quotation from Virgil's "Georgics" which was adopted as the motto of the Hawkesbury Agricultural College—"*Pater ipse colendi haud facilem esse viam voluit.*"—"The great Father Himself willed that the way of the husbandman should be no easy one." By substituting wheat-farmer for husbandman the quotation is very apt, and to lessen the hard work of wheat-growing it appeals to me that we should follow the American example of making a portion of our grain crop walk to market.

Departmental and private experiments have shown two methods of combating the fungous diseases, either by a long bare fallow or a rotation crop of oats. The latter appeals to me as preferable and opens up immense possibilities for the breeding and fattening of lambs. Even the most sceptical cannot but admit the excellent returns received for fat lambs, small farmers with their one or two trucks to Homebush getting up to £2 per head. "Willeroo" station, near Trangie, obtained the wonderful average of 40s. 10d. for 4,000 Romney cross suckers sold at Homebush during January and February. On Mr. D. T. Herbert's property near Bogan Gate 3,000 Border Leicester cross suckers were sold in the paddock at 31s. per head, aged 4½ months.

Last September the buyer for an export firm visited Parkes and paid 5s. per head more for my Border Leicester cross suckers than for lines of come-back suckers, and the latter had to be kept for an extra month. This should be stressed, as it shows the farmer the necessity of specialisation (not half-hearted methods) to obtain the fullest results. The prospects are brighter than they were even twelve months ago, and the world's markets are ready to absorb more lambs at highly satisfactory prices. At a meeting in

Tasmania of the Farmers and Stockowners' Association in connection with the Meat Industry Encouragement Act, one speaker contended that the first duty was to build up flocks, and it was not practical at present to talk of an export trade; in addition, black-faced breeds must be introduced for successful lamb-raising, and the quality of the wool must then deteriorate. Against this another speaker argued that in regard to the effect on the wool clip, the raising of fat lambs was not a pastoral proposition but an agricultural one. He pointed out that he had increased his income by £700 a year by raising fat lambs, and that bred from white-faced rams. Personally I agree with the last speaker, and there need be no deterioration of the wool clip if farmers will breed from the right class, namely, large-framed Merino, comeback, or first cross ewes. These, mated with longwool rams, will produce export lambs, and that bogey of so many farmers—the wool of the lamb—need not be considered. The lamb is bred to market, not to hold, and over a period of ten years not 1 per cent. of my lambs have passed over the board at shearing time; any small carry-over from the spring will readily fatten during the autumn or winter. In New Zealand coarser woolled ewes are bred from, hence the use of black-face rams, but under our conditions these ewes are not suitable as they lamb altogether too late to permit of the sucker being marketed before the hot weather sets in, with burrs and grass seed plentiful. To breed rams for station use, I have a small Border Leicester stud, and the ewes will not lamb before the end of August and September, at which time the cross suckers are nearly ready for market. It has been practically impossible during the last two years for one to purchase young first cross ewes, showing clearly that all the lambs bred have been marketed. With the extension of the industry there will be the opportunity for other breeders to supply the right type of ewe to the fat lamb raiser.

I will now deal with oats and quote two of our most successful and prosperous farmers—Mr. W. W. Watson, "Woodbine," and Mr. A. Milgate, "Rockvale," who have consistently grown oats as a ration crop, Mr. Watson over a period of twenty-two years. The farms to-day are a credit to their owners and the district, and Mr. Milgate, in 1922, won the Parkes P. and A. Association wheat crop competition and the Western Districts Championship (the R.A.S Competition). The paddock had prior to this champion wheat crop grown two crops of oats. Both these farms are always well studded with hay stacks, which have enabled the owners to tide over the lean years without loss of stock. During the 1924–25 season Mr. Watson cropped 100 acres of Sunrise oats on stubble land, sowing 1 bushel with 35 lb. superphosphate per acre. The land was cultivated with a one-way disc and drilled at the end of March. Five hundred sheep were grazed in the paddock from the middle of May till the last week in August. Later 60 tons of prime short hay was harvested. Mr. Milgate, to use his own expression, roughed in an area of 400 acres, second year fallow, the soil being in good order. The variety was Algerian, half-bushel per acre, sown the end of March and early in April. Two hundred acres were drilled, and following rain the remainder was sown with the combine drill. From the second week in May to the last week in

July 600 ewes and 400 lambs were grazed. Later 120 tons hay and 600 bags of oats were harvested, and a hailstorm crossing portion of the paddock yielded £290 insurance. Since then 500 ewes have been kept in prime condition, and there is now a self-sown crop which will graze 1,000 dry sheep during the winter and spring. Truly a profitable paddock! On "Beechmore" I planted an area of 100 acres—Algerian, Guyra, and Lachlan (no Sunrise oats available) on a stubble paddock which had previously grown two successive wheat crops. The land was worked with one-way disc and drilled in March. Three hundred ewes with lambs were in the paddock from the middle of May for a period of six weeks. Later 100 tons silage, 120 tons hay, and 250 bags of oats were taken off, and over an area of 40 acres which was reserved for grain and was knocked about by storms there is now a self-sown crop.

The above experience shows that—(*a*) in a lean year the oat paddocks will top off the lambs; (*b*) in a moderate year, portion of the paddock may be reserved for fodder; (*c*) in a flush year similar to 1924 practically the whole area may be utilised for fodder reserves following a period of grazing.

I find that during the early stages of the crop growth, much better results are obtained by removing the ewes and lambs over night to an adjoining small shelter paddock. After the first couple of days the sheep are no trouble and will quietly draw out in the evening and be waiting at the entrance gate in the early morning. Also if the paddock is heavily stocked it is apt to become stale, and as sheep naturally like variety, a few days change to a grass paddock is beneficial. A quick and inexpensive method of temporarily securing portion of a crop paddock or shelter belt is to use stakes and 36 x 3 x 16 wire-netting.

With breeding ewes, and especially for fat lambs, it pays to be thorough. An interesting article in the February issue of the *Pastoral Review* described the grazing of sheep on the high ranges of the Rocky Mountains (U.S.A.), up among the clouds, where the flocks have to be shepherded and protected from blizzards which oft times sweep the ranges. It is a recognised saying there that as regards the sheep industry "Eternal vigilance is the price of success." In Australia the fly trouble calls for the same eternal vigilance.

Another feature of the growing of oats is that it provides a cheap and practical scheme of fodder conservation. It is valuable stored as silage in pits, hay pressed, or grain stored in tanks or bins. Oaten hay is recognised as a valuable fodder in times of drought, and pressing will keep it in a good condition and free from the ravages of rats and mice. Groups of farmers, by applying the teaching of the Agricultural Bureau movement, namely, community spirit and co-operation, could combine to purchase and work hay presses, chaff-cutting plants, &c., and thus overcome what is most prevalent, the over-capitalisation of the farm as regards machinery. If the Government were in earnest to formulate a national scheme of fodder conservation, the three methods above, namely, silage, pressed hay, and grain stored from

mice, would provide a safe basis for advances to be made to small farmers and others who are not financially able to conserve and hold fodder over a period of years.

Summing up, the sowing of oats as a rotation crop would mean :—

(*a*) The growing of healthier wheat crops with resultant heavier yields and greater profit to the grower.

(*b*) The ravages and loss from fungous diseases would be lessened.

(*c*) Increased fertility of the land, especially if superphosphate is used, with added farm value.

(*d*) The breeding and marketing of greater numbers of fat lambs, yielding a considerable source of profit to the farmer.

(*e*) An inexpensive source of supply for the conservation of fodder, either for the farmers' own use or for sale during periods of drought.

I will now quote the number of sheep in New South Wales over a period of years, showing the fluctuations (thousands and hundreds omitted):—1891, 61,00,000; 1894, 56,000,000; 1901, 41,000,000; 1902, 25,000,000; 1904, 33,000,000; 1911, 43,000,000; 1912, 38,000,000; 1914, 35,000,000; 1918, 39,000,000; 1919, 33,000,000; 1920, 30,000,000; 1921, 34,000,000; 1922, 34,000,000; 1923, 32,000,000; 1924, 37,000,000; and during the latter four years New Zealand had a total number of between 17,000,000 and 18,000,000 sheep.

Exports from New South Wales and New Zealand to the United Kingdom over a period of four years (figures taken from the *Pastoral Review*) were :—

New South Wales.

	Mutton.	Lamb.
1921	167,203	216,496
1922	543,522	366,469
1923	772,006	847,760
1924	111,748	267,991
Total	1,594,479	1,698,725

Grand totals, N.S.W. 3,293,204 carcases.

New Zealand.

	Mutton.	Lamb.
1921	3,686,176	3,885,544
1922	2,893,763	4,825,005
1923	1,753,484	4,614,659
1924	2,189,318	4,592,945
Total	10,522,741	17,918,153

Grand totals, N.Z. 28,440,894 carcases.

The above figures are worthy of our most serious consideration and provide much food for thought.

New Zealand during the last four years has exported 28,440,894 sheep and lambs on a value basis of 30s. a carcase, worth £42,660,000. New South Wales with double the number of sheep has only exported 3,293,204 sheep and lambs, on the same basis of value worth £4,940,000. New Zealand, with her sheep totals practically stationary, exports the yearly increase,

cuts out losses and adds to the national wealth. New South Wales has learnt little from the experiences of the last thirty years, and with her almost negligible exports, holds the increases of the good seasons to lose them when the lean season arrives. Breeding from an average of 14,000,000 ewes we should have an export at least equal to New Zealand. Given this continuity of supply, better prices would be realised as our market connections abroad would be continuous and stable. Under our present erratic export we cannot expect our railways, abattoirs, and freezing works to be able when called upon suddenly to handle millions of sheep and lambs.

The farmers of the wheat belt have the opportunity of righting the present suicidal policy by the breeding of export lambs, keeping the sheep totals on a safe basis, thereby minimising drought losses, and adding to the prosperity of the individual and the State.

A VALUABLE DISCUSSION.

Called upon by the President of the Conference (Mr. W. E. Tayler) to address the gathering, the Hon. A. G. Manning, Chairman of the Australian Meat Council, moved a vote of thanks to Mr. Clatworthy for his paper. He had listened that morning to the address of Mr. W. S. Kelly with the greatest interest. To him it was a classic, and should have been heard by every farmer in the State who was concerned with wheat or with sheep or both. It was particularly interesting to him to note how Mr. Kelly had declined to be drawn into recommending Subterranean clover for any and all conditions. That in itself was proof that Mr. Kelly was a practical man. What had been said by Mr. Clatworthy, too, applied to all our wheat districts. There was no doubt that farmers would have to adopt Subterranean clover in non-arable pastures, and would have to grow oats and conserve fodder on their wheat lands. The first necessity to the proper development of a market for fat lambs from Australia was continuity of supply. It was most disconcerting for the agents in London, who were endeavouring to develop a market there for Australian lambs, to find, after there had been a steady supply for some little time, that there were no more lambs coming forward, and that, in consequence of a dry season or something else, there would be no more for some months. It was absolutely essential to go in for fodder-crop growing and for the conservation of fodder with a view to ensuring regularity of supply. In New Zealand the Meat Board had power to control the export, with the result that they were able to avoid periods of over-supply on one hand and of insufficient supply on the other. Moreover, New Zealand lambs were largely exported on consignment, the grower retaining his interest in his lambs right up to the moment when they were sold to the retail shopkeepers. The consequence was the New Zealand farmers got the full advantage of a rise in the market. The Australian Meat Council had no such power, and the grower was dependent altogether on the speculator, who made all the profit from any rise in the market.

It was particularly fortunate for Australia that Mr. J. B. Cramsie was in London at the present time. Mr. Cramsie was perhaps the ablest man that had ever represented producers in Sydney in any line, but his steady devotion to the interests of the producers had brought him into disfavour in certain quarters. In consequence of Mr. Cramsie's visit to England representations had been made by the Federal Government to the British Government that the Food Prices Commission (sitting in that country) should not close its enquiries until Mr. Cramsie was able to place the Australian producers' point of view before that Commission. That request had been granted, and Mr. Cramsie would be able to give evidence that was certain to be of the greatest importance to both producers and consumers. Undoubtedly there was too great a disparity between the prices obtained by producers and those paid by consumers, but it would be most difficult to trace where the profits were made, even with the help of the British Commission referred to.

What had to be learned in Australia was to supply what was wanted by the market. He was no doubt treading on dangerous ground in making any forecast about primary products, but he believed there would always be a keen demand for lambs. Beef was a necessity in Great Britain, and the price was low, but lamb was a luxury and there appeared to be every reason to anticipate that the price would always be good, and also that the demand would be steady. There were also serious handicaps to be overcome at the London end. There was the prejudice against frozen meat. He recalled a dinner given in London by a gentleman interested in Australian trade, who, in order to show the prejudice against frozen beef, procured the best Scottish beef for the table but announced that it was Australian frozen. The guests considered that everything at the table was excellent except the beef, which they said had manifestly been driven a long distance to the killing works! Then there were the high prices demanded in respect of the whole cargo of frozen meat in the Port of London, once the ship's hold was opened, even though the quantity removed from the hold was small. On the other hand, amb and mutton, being always frozen, had a great advantage over chilled beef in that frozen meat need not go into consumption immediately as must chilled meat.

The present was an opportunity that should be seized by Australian farmers. The British Government was distinctly favourable to the products of the Dominions, and in the present Secretary of State for Dominion Affairs, Mr. Amery, there was a man who understood the Dominions, their conditions, and requirements, and who was desirous of developing trade relationships with the outer parts of the British Empire. The present was thus a moment for a forward move, and Mr. Clatworthy's paper was the more valuable on that account.

Mr. W. R. Glasson seconded the motion. In the Molong district they had been producing fat lambs for some time, and had had very good returns, but they were only now beginning to take a real interest in the growing of fodder crops, and he was therefore particularly glad to hear what Mr. Clatworthy had had to say. In the Molong district, with only grass-

fattened lambs, one farmer's whole crop of lambs at five months old averaged 32s. 9d. Mr. Glasson himself sold his ewe lambs in the paddock at 32s. 6d., the wether lambs at Flemington on the same day averaging 38s. 6d. So far they had not attempted topping-up with "artificial" feeds, but he intended to try that method, and in fact had already started by making a sowing that year. Being more of a pastoralist than a farmer, he rather fancied barley and was sowing 200 acres, but he was also sowing strips of oats and wheat through it. He hoped to be able to give some interesting figures some day in the future. He congratulated the Agricultural Bureau upon having such an enthusiastic and thorough exponent of better methods as Mr. Clatworthy, and hoped members would return home determined to turn out the highest quality lambs.

Mr. G. D. Bassett (Forbes), supported the motion, relating a few experiences on lucerne on the Lachlan flats.

Mr. F. B. Hinton, Sheep and Wool Expert, emphasised the importance of using suitable breeds of sheep for the fat lamb business. Two classes had to be kept in mind—the pastoralist fat lamb raiser and the mixed farmer fat lamb raiser. Mr. Clatworthy had dealt chiefly with the latter, pointing out how returns could be improved and the quality of the lambs also bettered. As to the discrepancy between the production of fat lambs in New Zealand and New South Wales as against the total sheep population of the two countries, it was only fair to remember that the crossbred formed a very large proportion of the New Zealand sheep, whereas the proportion of Merino (which were really wool sheep) was far larger in Australia. As the production of fat lambs was a normal and regular feature of running the crossbred, the discrepancy in the totals of frozen lambs exported was largely due to the breeds of sheep kept in the different countries. It was essential that lambs should be got away quickly from the farm, or overstocking would take place. The weight should run from 33 lb. to 40 lb. dressed weight. Anything above was apt to be classed as mutton by the exporters, and anything under 33 lb. was too small and suffered in value. It was essential, also, that the sheep should reach the killing works with the bloom still on them. This was not so easily secured in New South Wales where the sheep had to be railed long distances, whereas in New Zealand many lambs were run in motor lorries to the works which were only an hour or two's travelling away. The Department had found the closer the sheep got to the British breeds the earlier the maturity, and the nearer the Merino the slower the maturity, so that British breeds were essential to the best results and to best quality. The crossbred also did best on the mixed farm because their wool did not suffer so much on cultivated paddocks as did that of Merino sheep. If farmers would analyse their returns from the farm for the last ten years they would find that the fat lambs had been the most profitable part of the farm output.

Mr. Kelly (South Australia), in supporting the motion, approved of Mr. Clatworthy's advocacy of oats as a rotation crop with wheat.

Mr. Glasson, replying to a remark, said there were two distinct purchasers to be catered for—the export purchaser, who wanted lambs of 32 lb. to 37 lb., and the purchaser for home consumption, who rather preferred a slightly heavier lamb of, say, 40 lb.

Mr. H. K. Nock (Nelungaloo) favoured barley as a fodder crop. His experience was that it was ready earlier than oats, and enabled the lambs to be got away earlier. Oats were rather late, and there was a danger of the lambs not being ready for the market before grass seeds became a trouble and depreciated the value of the young stock by causing them to lose their bloom. Touching upon Mr. Kelly's address in the morning, he also advocated the use of superphosphate as a top-dressing on grass lands. They would find the grass more abundant, sweeter and earlier, where it had been top-dressed. Sudan grass had been rather deprecated, but his experience had been very satisfactory. On a block of 40 acres he grazed a lot of backward lambs for three weeks, removed them for a fortnight and put them on again for ten days, and repeated the performance. The lambs greatly improved under that treatment. It was true that if Sudan grass were in a paddock with other feed the sheep might leave it alone, but if it was the only feed in the paddock he found they appreciated it. He would advocate, too, the use of more lucerne on the dry lands (so-called) of the district. He had it on land quite away from the river, and got good results from it. *Panicum antidotale* was a useful introduction, which furnished a valuable green shoot in the spring that was very useful for lambs, and that was particularly sweet and attractive to sheep. He was quite sure the fat lamb business was only in its infancy in this State.

Messrs. O'Donnell and Tanswell having added a few words, the vote of thanks to Mr. Clatworthy was carried with a cordial round of applause.

To Fumigate a Chaff Shed.

"Could you advise me as to the best method of destroying wheat weevils in my chaff shed? It is a brick shed of 18 by 13 feet, and has about 4 tons of loose chaff in it."

The insects in the chaff were probably meal worm beetles, not weevils, the writer was informed, but for either, fumigation with carbon bisulphide was best, so long as the shed was not too open and could be rendered practically gas-proof. Assuming the height of the shed to be 12 feet, the cubic content would be 2,808 cubic feet, and for this a charge of 22 lb. of liquid carbon bisulphide would be necessary. All cracks should first be sealed by pasting over them strips of paper; the carbon bisulphide should then be poured over the chaff, and the door closed and carefully sealed.

If the shed could not be rendered gas-tight, it would be best to fumigate the material in a gas-tight water tank or a bin, the carbon bisulphide being used at the rate of 2 to 3 lb. per 1,000 cubic feet of space. Twelve to fifteen hours exposure to the fumes was necessary. No lights or lighted pipes or cigarettes should be allowed in the vicinity, as the fumes of carbon bisulphide light readily and even explode. Commercial carbon bisulphide costs about 1s. 6d. per lb.—W. B. Gurney, Government Entomologist.

Top-dressing Pastures.

Results of Trials in Various Parts of the State.

J. N. WHITTET, H.D.A., Agrostologist.

Now that the values of sheep are higher than has been the case for many years, and as the production of high quality wool and early-maturing lambs is receiving considerably more attention than in former years, pastoralists and farmers are paying greater attention to the valuable work of pasture improvement. The success achieved in previous seasons from small top-dressing trials led to more extensive tests being conducted during 1924–25. In every case favourable results were obtained and the work is now established on a sound footing.

The plants which respond most readily are rapid growing, succulent plants such as clovers, some of the native grasses, and most of the succulent introduced grasses. While some of our native grasses, such as the various species of Star or Windmill (*Chloris* spp.), Panic (*Panicum* spp.), and Wallaby (*Danthonia* spp.) respond to the fertiliser, others such as Spear (*Stipa* spp.) and Three-awned Spear (*Aristida* spp.) grasses, do not.

Light dressings of superphosphate in dry localities have given the best all-round results, and being comparatively cheap, this material is one of the most economical fertilisers to use. In these districts the fertiliser should be applied in April or May in order that the herbage will receive the full benefit of the application.

For summer pastures in cold localities the fertiliser should be applied in July, while for winter grasses and clovers, such as Toowoomba Canary (*Phalaris bulbosa*), Tall Oat (*Avena elatior*), Cocksfoot (*Dactylis glomerata*), Perennial Rye (*Lolium perenne*) and the perennial forms of Red clover (*Trifolium pratense* var *perenne*) applications should be made in March.

Following are details of trials at various centres :—

Glen Innes.

(Average annual rainfall for forty-one years, 31·62 inches.)

An experiment designed to test the residual value of fertilisers, was carried out at Glen Innes Experiment Farm. The following grass mixture was sown on 1st April, 1919 :—Perennial Rye (*Lolium perenne*), 12 lb. ; Cocksfoot (*Dactylis glomerata*), 8 lb. ; Kentucky Blue (*Poa pratensis*), 10 lb. ; *Phalaris bulbosa*, 6 lb. ; Perennial Red clover, 4 lb Kentucky Blue failed to germinate, and by 1922 the stand of clover and rye was very thin and patchy. *Phalaris bulbosa* and Cocksfoot have thickened up considerably and dominate the plots.

In August, 1919, the following trial was begun with plots top-dressed as follows:—

Plot 1. Nitrate of soda 150 lb., superphosphate 75 lb., sulphate of potash 75 lb. per acre.
,, 2. Nitrate of soda 150 lb., superphosphate 75 lb. per acre.
,, 3. Superphosphate 75 lb., sulphate of potash 75 lb. per acre.
,, 4. No manure (check).

The averages of each year's weighings (green material) from 1919 to 1922 inclusive were:—

	tons	cwt.	qr.	lb.		tons	cwt.	qr.	lb.
Plot 1 ...	3	3	2	14	Plot 3 ...	3	16	2	21
„ 2 ...	3	9	1	14	„ 4 ...	2	8	3	14

In view of the costliness of these applications, it was decided in 1923 to discontinue them, but observations have since been taken of the residual effect of the fertilisers. No very marked differences could be seen during 1923, as the season was an exceptionally dry one, but all the manured plots were about 25 per cent. better than the check plot. Good rain fell during 1924. After feeding off the early growth, the plots were closed up, and when the accompanying photographs were taken in November, 1924, a decided difference in the growth on the treated and untreated plots was apparent. The plots were weighed on 19th January, 1925, and yielded as follows:—

	ton.	cwt.	qr.		ton	cwt.	qr.
Plot 1 ...	1	18	1	Plot 3 ...	1	16	1
„ 2 ...	1	17	1	„ 4 ...	0	15	1

These results demonstrate that the residual effect of fertilisers is apparent for some years after the application is made.

Kentucky.

(Average annual rainfall at Uralla for thirty-eight years, 32·08 inches.)

This pasture was situated on somewhat flat land on Mr. B. Smith's property, "Colessie." The land was limed in 1920 and sown with Cocksfoot 6 lb., Perennial Red clover 6 lb., and Bokhara clover (*Melilotus alba*) 2 lb., in autumn, 1921. The Bokhara clover has since died out. In August, 1922, superphosphate at the rate of 1 cwt. per acre was used as a top-dressing.

The present top-dressing trial was commenced in October, 1924.

Plot 1. No manure.
,, 2. Nitrate of soda 28 lb., superphosphate 112 lb. per acre.
,, 3. Superphosphate 112 lb. per acre.
,, 4. Basic superphosphate 112 lb. per acre.
,, 5. High-grade superphosphate 112 lb. per acre.
,, 6. Sulphate of ammonia 22 lb., superphosphate 112 lb. per acre.
,, 7. Nitrate of soda 28 lb., superphosphate 112 lb., sulphate of potash 28 lb. per acre.
,, 8. Sulphate of ammonia 22 lb., superphosphate 112 lb., sulphate of potash 28 lb. per acre.
,, 9. Nitrate of soda 22 lb., basic superphosphate 112 lb., sulphate of potash 28 lb. per acre.
,, 10. No manure.

All manured plots showed an improvement over the unmanured. The growth on plots 8 and 6 was most marked, being respectively 200 and 130 per cent. better than the unmanured land. Next in order of merit were plots 9, 2, and 7, all of which gave an appreciable increase over the unmanured land. Superphosphate, basic superphosphate, and high-grade superphosphate showed little increased growth in this situation.

The manures stimulated the Perennial Red clover growth, this being most marked on plot 8.

On Mr. R. J. Job's property, "Radnor," Toowoomba Canary (*Phalaris bulbosa*) and Tall Oat (*Avena elatior*) grasses received 2 cwt. superphosphate in May, 1924. This plot is on the slope of a hill and consequently well drained. In December weights were obtained from the plots as follows:—

	tons.	cwt.	qr.
Phalaris bulbosa unmanured	6	14	0
,, ,, top-dressed	8	13	0
Avena elatior unmanured	8	3	0
,, ,, top-dressed	11	0	0

Crookwell.

(Average annual rainfall for thirty-nine years, 32·19 inches.)

An old pasture paddock on Mr. C. E. Prell's property, "Gundowringa," that had been very heavily stocked in the past, and was practically eaten out, was selected for trial, and top-dressed in August, 1924, as follows:—

Plot 1. Superphosphate 112 lb. per acre.
,, 2. Basic superphosphate 112 lb. per acre.
,, 3. High-grade superphosphate 112 lb. per acre.
,, 4. Nitrate of soda 28 lb, superphosphate 112 lb. per acre.
,, 5. Sulphate of ammonia 22 lb, superphosphate 112 lb. per acre.
,, 6. Nitrate of soda 28 lb., superphosphate 112 ib., sulphate of potash 28 lb. per acre
,, 7. Sulphate of ammonia 22 lb., superphosphate 112 lb., sulphate of potash 28 lb per acre.
,, 8. No manure.

The predominating plants in the pasture were Cockstoot, Perennial Rye, Sheep's Burnet (*Poterium sanguisorba*), and Ball and Hop clovers (*Trifolium glomeratum* and *T. procumbens*).

All top-dressed areas showed considerable improvement over the unmanured plot, the clovers being thickest in plots 1, 2, and 3. There was no apparent difference between plots 1, 2, and 3, which provided an excellent mixture of succulent feed, comprising grasses, clovers, and Sheep's Burnet. In regard to economy in cost of fertiliser, plot 1 is favoured in preference to 2 and 3.

Plot 4 contained less clover than the previous ones, although the growth of grasses was as strong. Plot 5 contained less clover than 4 and grasses were not as forward in growth. Plots 6 and 7 were a little better than 4 but not as good as 1, 2, and 3.

The amount of increase in the weakest top-dressed plot was 50 per cent. better than the unmanured area (plot 8); whereas the carrying capacity of the unmanured area would hardly be one sheep per acre per annum, the area top-dressed with 1 cwt. superphosphate per acre would easily carry two sheep per acre per annum. It must be remembered that this improvement was effected on a practically worn-out pasture, which, previous to applying the fertiliser, the owner intended to plough up and re-sow in the autumn of 1925

In this *Gazette* for February last (pp. 115–120), full particulars are given of the response made by introduced grasses, Subterranean (*Trifolium subterraneum*), Cow Grass and Perennial Red clovers on this property. Subterranean clover top-dressed with 140 lb. superphosphate per acre carried four sheep per acre, whereas this plant unmanured would only carry half that number of sheep. Perennial Rye, Cocksfoot, Tall Oat (*Avena elatior*) and *Phalaris bulbosa* grasses, Sheep's Burnet, Cow Grass, and Perennial Red clovers, also gave considerably increased returns from an application of 140 lb. superphosphate per acre. Twelve acres of a 120-acre native grass paddock received 140 lb. superphosphate per acre, and the sheep preferred this manured section, eating the plants close to the ground. There was plenty of feed on the unmanured portion, but the animals were evidently obtaining more nourishing feed from the treated areas.

Lismore.

(Average annual rainfall for thirty-nine years, 50·96 inches.)

The following plots were included in a trial which is being carried out at Wollongbar Experiment Farm, with the object of investigating the best treatment for rejuvenating worn-out paspalum (*Paspalum dilatatum*) pastures:—

1. Unfertilised and not cultivated.
2. Unfertilised and cultivated.
3. Bonedust 1 cwt., superphosphate 1 cwt. per acre and cultivated.
4. Superphosphate 2 cwt. per acre and cultivated.
5. Sulphate of ammonia ½ cwt. per acre and cultivated.
6. Sulphate of ammonia ½ cwt., superphosphate 2 cwt. per acre and cultivated.
7. Basic superphosphate 2 cwt. per acre and cultivated.

The fertiliser was applied in July, 1924, after the cultivated plots had been worked over. On 3rd December, 1924, plot 7 (basic superphosphate) was showing up well, the growth of grass and White clover being very vigorous. Plots 6, 3, 4, and 5 were inferior to No. 7, and in value ranged in the order mentioned. Plot 2 showed fairly good growth, but was not as good as the manured plots, while the uncultivated, unmanured plot had made no spring growth whatever. Plots 3 to 7 inclusive, were showing foliage growth (excluding seed stems) up to 1 foot in height.

On 25th February, 1925, the basic superphosphate plot was superior to any of the others, the clover development being particularly good. The remaining top-dressed and cultivated plots were superior to plot 1, which, although it had carried no stock for over six months, showed very little growth.

In another section of this paspalum renovation trial, adjoining plots of ploughed and unploughed grass show marked differences. Where the sod had been completely broken up by thorough ploughing and cultivation during May and June, 1924, the pasture appeared to be completely rejuvenated, the grass being 3 to 4 feet high, in seed, of a healthy colour, and very vigorous. On the ploughed plot the sole of grass soon thickened up, and being composed of healthy plants in soil which had been aerated and sweetened by the ploughing, should prolong the life of the pasture for many years.

Where ploughing can be carried out the work should be done in April or May, using a mouldboard plough turning furrows about 8 inches in width. The furrows should be broken down with a heavy harrow and the following seed mixture sown:—Wimmera Rye, 4 lb. per acre; Tall Fescue, 2 lb.; Lucerne, 1 lb.; Perennial Red clover, 1 lb.; Subterranean clover, 1 lb. The seed should be covered by harrowing it well into the ground, and the area top-dressed when the plants are well up with 2 cwt. basic superphosphate. On areas not accessible to the plough, 2 cwt. of basic superphosphate should be broadcasted per acre during the late winter months.

Dungog.

(Average annual rainfall for twenty-five years, 36·64 inches.)

On Mr. Alex. Smith's property at Bandon Grove a mixed pasture of Paspalum and White clover was top-dressed as follows:—

Plot 1. No manure.
„ 2. Superphosphate 188 lb. per acre.
„ 3. Superphosphate 188 lb., nitrate of soda 56 lb. per acre.
„ 4. Blood and bone 188 lb. per acre.
„ 5. Blood and bone 188 lb., nitrate of soda 56 lb. per acre.
„ 6. No manure.

All the treated plots showed a marked improvement over the unmanured check, but none more so than the superphosphate plot, the growth of clover there being very marked. The cows showed a marked preference for plot 2, evidently because of the large quantity of clover present. Twelve months after top-dressing there was a marked increase on the treated areas, due to the residual effect of the fertilisers, the plots receiving superphosphate showing up best.

Kiama.

(Average annual rainfall for thirty-seven years, 50·99 inches.)

An experiment was carried out in this district on a mixed pasture of Paspalum and Perennial Rye grasses, and Perennial Red and White clovers:—

Plot 1. Sulphate of ammonia 1 cwt. per acre.
„ 2. No manure.
„ 3. Nitrate of soda 1 cwt., basic superphosphate 2 cwt. per acre
„ 4. Basic superphosphate 2 cwt. per acre.

The following quantities of green material were obtained per acre :—

	tons	cwt.	qr.	lb.		tons	cwt.	qr.	lb.
Plot 1 ...	2	2	0	15	Plot 3 ...	2	8	2	13
„ 2 ...	0	12	3	24	„ 4 ...	2	18	1	10

The sulphate of ammonia and nitrate of soda both appeared to discourage the growth of clovers, while the basic superphosphate increased it. This accounts for the difference in yields of plots 3 and 4.

Jamberoo.

(Average annual rainfall for twenty-eight years, 48·71 inches.)

A more or less worn-out pasture of Mr. J. D. Richardson's at Croome Vale, consisting of Couch (*Cynodon dactylon*), Perennial Rye, Lesser, Ball and White clovers (*Trifolium dubium, T. glomeratum,* and *T. repens*), small patches of Paspalum (*Paspalum dilatatum*), Wallaby (*Danthonia semiannularis*), and Yorkshire Fog (*Holcus lanatus*), was treated on 5th August, 1924, as follows :—

Plot 1. No manure.
„ 2. Nitrate of soda 28 lb., superphosphate 112 lb. per acre.
„ 3. Superphosphate 112 lb. per acre.
„ 4. Basic superphosphate 112 lb. per acre.
„ 5. High-grade superphosphate 112 lb. per acre.
„ 6. Sulphate of ammonia 22 lb., superphosphate 112 lb. per acre.
„ 7. Nitrate of soda 28 lb., superphosphate 112 lb., sulphate of potash 28 lb. per acre.
„ 8. Sulphate of ammonia 22 lb., superphosphate 112 lb., sulphate of potash 28 lb. per acre.
„ 9. Nitrate of soda 28 lb., basic superphosphate 112 lb , sulphate of potash 28 lb. per acre.

An inspection was made in October, when plots 4 and 5 showed to best advantage, the clovers and trefoils having made good growth, and the paspalum was earlier than on the other plots. The sole in all manured plots was superior to the unmanured plot. The legumes had made little headway in plots 6 and 7. Allowing for the fact that surrounding areas were lightly stocked, the sole on the top-dressed plots was superior to these areas and to the unmanured plot. From time of application to inspection, about 1 inch of rain fell.

In December, 1924, plot 4 showed up well, but 5 seemed to have remained stationary, and was not equal to 4. Both these plots showed a good growth of clover. The plots receiving potash exhibited no evidence of improvement. The only nitrate of soda plot showing up was No. 2, but the improvement was in the sole of grass only.

Illabo.

(Average annual rainfall at Junee for forty years, 20·54 inches.)

An area of typical south-western slope country on Mr. J. Fitzpatrick's property, "Tilboroo," was top-dressed, the pasture containing Spear (*Stipa scabra*), Panic (*Panicum effusum*), two species of Wallaby (*Danthonia racemosa* and *D. semiannularis*), Three-awned Wire (*Aristida Behriana*),

and two species of Star or Windmill (*Chloris truncata*, and *C. acicularis*) grasses; also Ball clover and Haresfoot trefoil (*Trifolium glomeratum*, and *T. arvense*). A very persistent native weed plant in this pasture before top-dressing was Silver Weed (*Vittadinia australis*), but the vigorous growth of the grasses on the fertilised area has completely choked the weed out, whereas on the unmanured plot it is very plentiful.

One plot was manured in August with ½ cwt. of superphosphate, and the growth in October, 1924, was estimated as being 200 per cent. better than the unmanured area, all the plants, with the exception of *Aristida Behriana* and *Stipa scabra*, responding to the fertiliser, particularly Ball clover.

Seen again in March, 1925, the growth was phenomenal on the top-dressed plot, all plants of Wallaby, Star, and Panic grasses being green and bulky, whereas on the adjoining unmanured area these and other grasses were dry and scanty, the only plant thriving being Silver Weed. The top-dressed plot at this period was easily 300 per cent. better than the unmanured plot. The top-dressed clover had produced large quantities of seed, whereas on the remaining area very little growth had been made by the plants, and consequently seed production was very light.

Temora.

(Average annual rainfall for forty-three years, 20 inches.)

The trial was begun in August at the Experiment Farm on a well-grassed paddock containing Wallaby (*Danthonia semiannularis*), and Spear (*Stipa scabra*) grasses, Hop, Woolly, and Ball clovers (*Trifolium procumbens*, *T. tomentosum*, and *T. glomeratum*) with plots as follows:—

Plot 1. No manure.
" 2. Superphosphate 56 lb. per acre.
" 3. Superphosphate 84 lb. "
" 4. Superphosphate 112 lb. "
" 5. No manure.

With the exception of the Spear grass, all plants produced increased growth as a result of the application of fertiliser.

On 30th October, 1924, plot 2 showed 50 per cent. more growth than the unmanured plots, and while 3 and 4 were a trifle bulkier the slight increase would not compensate for the extra cost of the heavier dressings.

Hop and Ball clovers made excellent growth, and readily responded to the fertiliser.

In December, 1924, the area was fed off, and no further growth had resulted up till March, 1925, when the only material showing on all plots was small dry tussocks of Spear and Wallaby grasses.

Yerong Creek.

(Average annual rainfall for twenty-one years, 21·47 inches.)

The trial was conducted on Mr. G. F. Hutchings' property, "Dalrye," fertiliser being applied in August, 1924, as follows:—

Plot 1. No manure.
" 2. Superphosphate 112 lb. per acre.
" 3. Superphosphate 56 lb. "

The plants present in the pasture were Wallaby grasses (*Danthonia pilosa, D. semiannularis*, and *D. pallida*), Spear grasses (*Stipa scabra* and *S. setacea*), Stink grass (*Eragrostis major*), Barley grass (*Hordeum murinum*), Rat-tail Fescue (*Festuca bromoides*), and Burr, Ball and Hop clovers (*Mediango denticulata, Trifolium glomeratum*, and *T. procumbens*).

In November the grasses and clover on plot 1 were thin, and growth was very weak. Plot 2 showed an increase of 200 per cent. over plot 1; the Wallaby grasses and clovers readily responded to the fertiliser. The smaller quantity of superphosphate on plot 3 gave a very satisfactory result, the effect on the Wallaby grasses and clovers being most marked. Here again the small increase plot 2 showed over 3 did not warrant the extra cost for fertiliser.

In an adjoining paddock the stock were showing preference for an area top-dressed with 90 lb. superphosphate per acre, and were not eating the unmanured pastures to any extent. This continued right throughout the season, and when seen in March even the dry tussocks of grass on the top-dressed area had been eaten close to the ground, while the grasses on the adjoining unmanured sections of the paddock had not been touched.

In March, plots 2 and 3 still carried a thicker sole of grass than plot 1, and stock had preferred plots 2 and 3 to 1.

Bathurst.

(Average annual rainfall for sixty-four years, 23·88 inches.)

A pasture containing Wallaby grasses (*Danthonia semiannularis, D. racemosa*, and, *D. carphoides*), Rat-tail and Ball clover was top-dressed at the Experiment Farm in September, 1924, with plots arranged as follows:—

Plot 1. No manure.
 „ 2. Superphosphate 56 lb. per acre.
 „ 3. Superphosphate 112 lb. „
 „ 4. No manure.
 „ 5. Superphosphate 56 lb. per acre.
 „ 6. Superphosphate 112 lb. „
 „ 7. No manure.

In November very little difference was noticeable in the grasses on any of the top-dressed plots. Ball clover readily responded to the application of ½ cwt. superphosphate, but no increase in growth was apparent from the heavier application.

Practically no improvement was made by the pasture after the clover had finished its growth, and in March only the dry tussocks of the Wallaby grasses were in evidence.

Orange.

(Average annual rainfall for fifty-one years, 35·06 inches.)

A trial was conducted on a mixed pasture containing Cocksfoot, Wimmera Rye (*Lolium subulatum*), Lucerne (*Medicago sativa*), and Chilian clover (*Trifolium pratense* var *perenne*). The fertilisers used were:—

Plot 1. Basic superphosphate 2 cwt., nitrate of soda 1 cwt. per acre.
 „ 2. No manure.
 „ 3. Basic superphosphate 2 cwt. per acre.

Fig. 1.—Residual effect of Fertilisers at Glen Innes Experiment Farm.

This plot was top dressed with superphosphate (75 lb.) and sulphate of potash (75 lb.) in August, 1922. No further top-dressing was done till the photograph was taken in November, 1924.

Fig. 2. - No Manure Plot of above Experiment.

Note the difference in growth compared with Fig. 1.

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Fig. 3.—The Palability of Top-dressed Pastures

An area of 12 acres in a paddock of 120 acres on Mr. C. E. Prell's property at Crookwell, was top-dressed in August, 1924, with 140 lb. superphosphate per acre. The preference of the sheep for the manured area is illustrated above; the foreground was not manured.

Fig. 4.—Toowoomba Canary Grass on Mr. Prell's Property.

On the left, cultivated and top-dressed with 140 lb superphosphate; on the right untreated.

Fig. 5.—Native Pasture at Mr. G. F. Hutchings, "Dalrye," Yerong Creek.

In the foreground the pasture was top-dressed with 112 lb. superphosphate per acre; on the left and left distance, no manure was applied. Note that the sheep have eaten the manured section almost to the ground, neglecting the unmanured port on.

Fig. 6.—Paspalum Renovation Trials at Wollongbar Experiment Farm, Lismore.

On the right, the pasture was ploughed with a mouldboard plough, on the left it was untouched. Note the superiority of the growth on the ploughed section.

Fig. 7.—Uncultivated and unmanured Plot in the Paspalum Renovation Trial.

Fig. 8.—Plot of Paspalum cultivated and then fertilised with 224 lb. Basic Superphosphate per acre.

Compare the growth with that in Fig. 7.

Fig. 9.—Top-dressing trial on Native Pasture at Mr. G. F Hutchings', "Dalrye," Yerong Creek.

In the foreground no manure was applied ; from the handkerchief backward, 112 lb. superphosphate was applied ; and beyond that 56 lb. per acre. Note increased growth where the superphosphate has been used.

Fig. 10.—Another Top-dressing trial on Native Pasture. Mr. J. Fitzpatrick's "Tilboroo" property, Illabo.

The area shown was not top-dressed. Compare it with Fig 11.

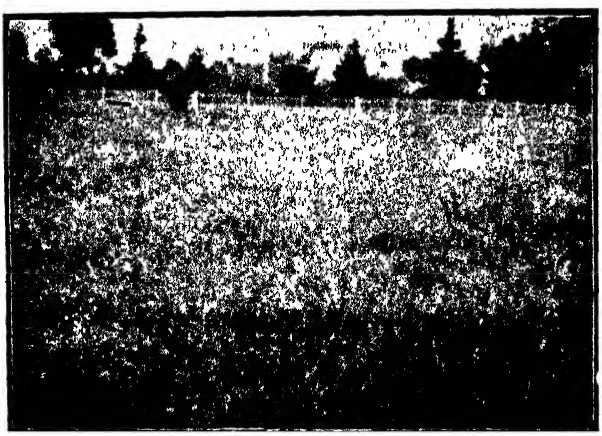


Fig. 11. The effects of Top-dressing.

This section on Mr. Fitzpatrick's property was top-dressed with 56 lb. superphosphate in August, 1924. All clovers, and most of the grasses, readily responded to the fertiliser.

Two cuttings were weighed from the plots, the aggregate yield of green material from each plot being as follows :—

		tons.	cwt.	qr.	lb.
Plot 1	... ..	3	10	3	1
,, 2	... ...	1	19	2	6
,, 3	... ...	3	13	1	5

The increase in the basic superphosphate plot was due to the ready response made by the clover and lucerne. As was the case at Kiama, nitrate of soda appeared to discourage the growth of clovers.

Cowra.

(Average annual rainfall for thirty-seven years, 23·58 inches.)

The trial was begun at the Experiment Farm on 25th July, 1924; the plots set out as follows :—

Plot 1. No manure.
,, 2. Superphosphate 28 lb. per acre.
,, 3. Superphosphate 56 lb. ,,
,, 4. No manure.
,, 5. Superphosphate 84 lb. per acre.
,, 6. Superphosphate 112 lb. ,,
,, 7. No manure.

On 14th October, 1924, the pasture contained Barley grass, Native Crowfoot (*Erodium cygnorum*), Crowfoot (*Erodium cicutarium*), Burr clover (*Medicago denticulata*), Spear grass (*Stipa scabra*), Wallaby grass (*Danthonia semiannularis*), and Rat-tail. All these plants, with the exception of the Spear grass, responded in some measure to the fertiliser.

The amount of growth in plot 2 was similar to the unmanured sections, a very slight increase being noticeable. In plot 3, a 30 per cent. increase in growth over plots 1, 4, and 7 was noted. Plot 4 was slightly better than the previous plot. Plot 5 showed a somewhat stronger growth than plot 4.

The most payable applications would be either 56 or 84 lb. of superphosphate per acre, but the slightly increased growth on plot 5 would not cover the extra cost of the increased application of fertiliser.

Crowfoot and clover burr showed greatest response to the fertiliser, and stock showed preference for these plants on the top-dressed sections, although their growth was somewhat coarse. Later observations made in February showed practically no difference in any of the top-dressed plots, but they were considerably better than the no-manure areas, as they contained more clover burr and the grasses were greener. Stock were eating the top-dressed plots in preference to the unmanured sections.

Parkes.

(Average annual rainfall for thirty-three years, 20·72 inches.)

Mr. H. K. Nock, Nelungaloo, top-dressed native pastures in June, 1924. The feed consisted mainly of Burr clover, Barley grass, Rat-tail Fescue, a little Black Oats (*Avena fatua*) and Creeping Salt-bush (*Atriplex semibaccatum*). All but the saltbush responded well to the fertiliser, and it was estimated that the carrying capacity had been increased threefold. Only 35 lb. of

superphosphate was used per acre. The extra growth of Burr clover on the top-dressed areas was very marked, and at the end of November the burrs were very plentiful on the treated areas, whereas on unmanured strips they were scarce. All classes of stock preferred the treated pasture, and the feed came away rapidly on same.

At the end of November, 1924, most of the green feed had gone, but there was increased growth on one of the fertilised areas. Dry plants of Rat-tail Fescue were most prevalent then, and although of little value to stock, they provided a cover for other plants during the hot weather, whereas the un-treated sections were practically devoid of vegetation, becoming hard and bare, with the surface soil drying out rapidly.

Trangie.

(Average annual rainfall for twenty-four years, 17·24 inches.)

Top-dressing was applied to plots at the Experiment Farm in August at the following rates:—

Plot 1. 28 lb. superphosphate per acre.
,, 2. 56 ,, ,, ,,
,, 3. 84 ,, ,, ,,
,, 4. Unmanured.

Spear grass or Corkscrew (*Stipa scabra*) was the dominant grass in the pasture, other plants present being two species of Wallaby grass (*Danthonia semiannularis* and *D. pilosa*), Star or Windmill grass (*Chloris truncata*), Burr clover and Tar Vine (*Boerhaavia diffusa*). With the exception of the Burr clover and Star and Wallaby grasses very little response was made to the application of the fertiliser. The Burr clover made strong growth on all manured plots, 56 lb. of superphosphate proving as effective as 84 lb., both being considerably better than the quantity applied to plot 1.

When seen in March, 1925, the most outstanding feature was that the manured areas were barer, having been grazed considerably more than the unmanured, thus showing that even when the fertilised grasses were dry the tussocks were more palatable to stock. More burrs of *Medicago denticulata* were present on the ground on plots 1, 2 and 3 than on plot 4.

Rainfall.

The rainfall records were supplied by the State Meteorologist. The rainfall in the districts under review for the period June, 1924, to March, 1925, was slightly above the average.

Conclusions.

1. Top-dressing pastures in most parts of the State is a profitable procedure, resulting in the quantity and quality of the pasture being increased.

2. Small quantities of superphosphate—½ cwt. per acre—are sufficient in the drier parts of the State, whereas in districts with good rainfall the quantity may be increased.

3. The residual effect of an application of superphosphate is often seen in succeeding years.

4. In coastal districts basic superphosphate is giving slightly better results than superphosphate.

5. Stock evidently do better on top-dressed areas, as they put on more condition and show preference for such areas over untreated sections.

6. Worn-out pastures, such as those at Crookwell and Jamberoo, benefited greatly from top-dressing. In these two cases the owners intended to plough up and replant, but now the grasses have thickened up to such an extent that replanting is unnecessary.

7. Weeds disappeared in top-dressed pastures, the vigorous growth of the grasses assisting in choking out detrimental plants.

8. Top-dressed areas remain green for a longer period than unmanured sections, thus providing succulent feed for a longer period, and diminishing the danger of bush fires.

9. Where pastures are poor and thin, stock have to travel over large areas, tracks are worn and plants destroyed, and animals lose their condition, whereas succulent pastures produce contentment, and animals fatten rapidly.

10. Worn-out paspalum pastures can be improved by ploughing and sowing seed of suitable plants and top-dressing. Where it is impossible to plough, a top-dressing of 2 cwt. basic superphosphate applied during the late winter is recommended.

Unit Value of Fertilising Materials.

The unit values of fertilising ingredients in different manures for 1925 are as follows:—

	per unit.
Nitrogen in nitrates	21s. 6d.
,, ammonium salts	18s. 0d.
,, blood, bones, offal, &c.	17s. 11d.
Phosphoric acid in bones, offal, &c.	4s. 9d.
,, (water soluble) in superphosphate	6s. 9d.
Potash in sulphate of potash	6s. 5d.

To determine the value of any manure the percentage of each ingredient is multiplied by the unit-value assigned above to that ingredient, the result being the value per ton of that substance in the manure. For example, a bonedust contains 4 per cent. nitrogen and 20 per cent. phosphoric acid:—

4	×	17s. 11d.	=	£3 11s. 8d.	=	value of the nitrogen per ton.
20	×	4s. 9d.	=	£4 15s. 0d.	=	,, phosphoric acid per ton.
				£8 6s. 8d.	=	value of manure per ton.

It must be clearly understood that the value thus assigned, depending solely upon the chemical composition of the manure, does not represent in all cases the actual money value of the manure, which depends upon a variety of causes other than the composition, and is affected by local conditions; neither does it represent the costs incurred by the manufacturer in the preparation, such as cost of mixing, bagging, labelling, &c. It is simply intended as a standard by which different products may be compared. At the same time, it has been attempted to make the standard indicate as nearly as possible the fair retail value of the manurial ingredients, and it will be found in the majority of cases the price asked and the value assigned are fairly close.—A. A. Ramsay, Chemist.

Dairying in the Central West.

W. H. BROWN, Editor of Publications.

An increase in interest in dairying has been a marked feature of the last year or two in the central west. Compared with wheat-growing and fat lamb-raising—to say nothing at all about wool-production—it is of exceedingly modest proportions, of course, and none of the major industries stand in any danger of being displaced by it in general importance, but the possibilities of dairying being profitably developed alongside, and even in some degree in association with the more established pursuits, are so good that small farmers in particular may confidently feel that the scope of mixed farming is being enlarged for them in an important direction.

Not, indeed, that the idea of dairying under western conditions is altogether new. Already it is well established in parts of the north-west, such as Tamworth, and on the south-western slopes and in the Riverina more butter is being produced than can be consumed locally, so that the factories there are looking round for other markets, hoping as yet to be saved from having to think of overseas export. There are two or three factories in the Riverina whose outputs each exceed the total of all the factories now operating in the central west, but suppliers there will probably find that many of the suggestions we have to make to farmers in the vicinity of Cowra, Forbes, Parkes, Dubbo, and Wellington also bear upon their own problems.

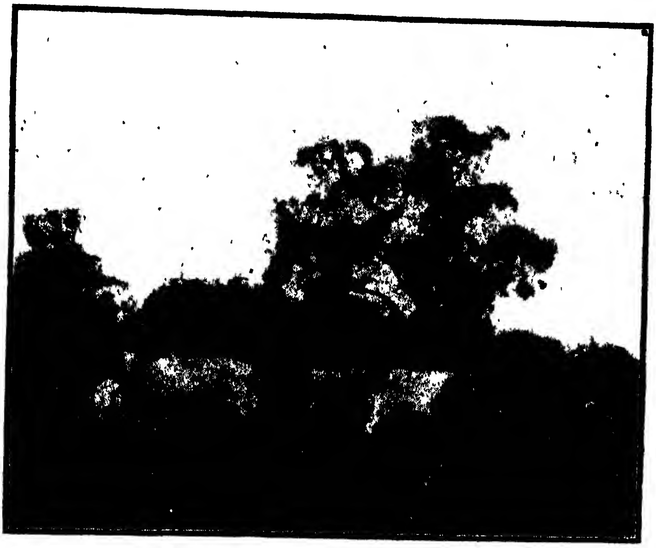
In the central west, too, dairying has had a history. An effort was made years ago to establish the industry in this same area, but under conditions that experience has since shown could not but result in disappointment. Something in the nature of a mild boom in dairying occurred at that time, and factories were erected at perhaps a score of places—so close together, in fact, and so many that none of them had a large enough area to ensure a reasonable number of suppliers. Working expenses were therefore disproportionately large, and when dry weather came with still further reduction in the turnover, the price paid for the cream fell so low as to discourage farmers and they quitted the business.

Conditions that Favour the Present Move.

To-day the conditions are considerably different. The number of factories is for the present very limited—three only in the district we are particularly thinking of, viz., Parkes, Dubbo, and Canowindra—and supplies of cream are being drawn from much larger areas, assistance in that direction being afforded by the greater number of railway tracks now open, and in cases by motor traction. This extensive distribution of the interests of the different factories is of considerable importance in the assurance it offers of

continuity of supply of cream. The likelihood of suppliers so widely separated being equally affected by a spell of dry weather is much smaller than when the suppliers were grouped together in a small area in which climatic conditions are practically certain to be uniform.

How wide is this distribution of suppliers can best be illustrated by quoting a few cases. Parkes factory, for instance, receives cream twice or three times a week from Forbes by motor lorry, the manufactured butter sold to Forbes' grocers furnishing a return loading. The same factory receives cream from a farmer who has to cart his can from near Grenfell to a siding on the Forbes-Stockinbingal railway, whence it is carried 35 miles by rail to Parkes. In



Some of Mr. F. Brady's cows at Parkes.

another case a farmer 17 miles by road from Condobolin sends cream all the way to the Blayney factory—159 miles by rail. This carriage of cream for distances that would not be contemplated on the coast is further illustrated by the Cootamundra factory, which has established relations with quite a number of the smaller wheat-growers at Temora, and relies on them for a substantial proportion of its cream. It is not an exaggeration to say that, subject to proper handling on the farm, western atmospheric conditions—different from those of the coast—actually favour the transport of cream for long distances without butter quality suffering.

Pasteurisation.

Pasteurisation is another factor in the improved conditions to-day. Though well understood for nearly half a century it is only within the last few years that it has become a regular feature in the practice of butter-making. The modern application of the principles of Pasteur enables a factory

manager to treat slightly inferior or first grade cream in such a way as to turn out a better butter. The result is the factory is able to pay better prices than years ago and thereby to keep its suppliers, and from time to time to attract new ones into the business.

It is, perhaps, timely to remark that suppliers must not expect pasteurisation to do everything. Cream quality largely rests with the suppliers themselves. "Stale" and "over ripe" have still to be written against consignments from too many farmers, but cream quality has a direct influence upon the price the factory is ultimately able to pay its suppliers. It should hardly need to be added that the better the price paid for cream the greater the attraction to other farmers to become suppliers, which, of course, means a reduced cost of production per pound. Thus the benefits of first-class cream are cumulative, and are enjoyed by everyone who consigns to the factory.

Yet another element of some importance in the revival of dairying in the district under discussion is the appreciation of the value of factory side-lines. Ice, ice-cream, frozen rabbits, and other things are all handled by some of the factories, and contribute to the reduction of running charges against the butter. In short, the present factory position is vastly more favourable to the development of the industry than in years gone by.

A Comparison with the Coast.

There are reasons, too, why dairying in the west has attractions even compared with the coast.

In the first place, the production, in the central west at any rate, is far from being sufficient for the demand. In other words, the consumption of butter in the towns within the area is far in excess of the supply, to say nothing of those towns further west that normally should draw their supplies from the nearest district suited to dairying. The production of butter in this part of the State is not one-half of local requirements, and factories place the whole of their output in their own localities without difficulty. Consumers' requirements are at present met in part by the Riverina (as stated above), but much more largely by the coastal districts—at what a disadvantage for handling in Sydney, plus railage for 200 or 300 miles, need not be said. As a matter of fact on this account alone local producers are in a far more favourable position for increased pays than their coastal competitors.

The western dairy-farmer enjoys the advantage compared with the man on the coast that his land is far less expensive. Certainly he needs a greater area, but the area of many farms on which a few cows have a place is not generally large. On a farm of 250 to 300 acres, worth say £10 per acre, it is generally possible to carry a herd of 30 cows, even away from the rivers, the single condition being an assurance of plenty of water. The case of a coastal farmer on, say, 75 to 100 acres, worth £40 to £60 per acre, is decidedly less favourable.

Winter Production Essential to Best Results.

This, then, is the present position as to dairying in the portion of the State under notice. The errors of the past have been largely eliminated, a market exists, and the general conditions favor the development of the industry.

The special purpose of the present article, however, is to point out that maximum success is likely to be obtained by the recognition that there are certain months in the year when dairying is distinctly more profitable and practicable than in the rest. On the coast these months are the summer months. In the west they are the winter months

It is then that feed is most abundant and reliable, for the country of which we are writing is winter country that generally shows a nice spring in the cooler months and that, therefore, is of greatest carrying capacity from, say, June till November. It is then, too, that prices are best, being least affected by the competition of the coastal districts. At that time of year, also, on the mixed farm other crops demand least attention.

Mr. J. Godwin's Jerseys on natural grasses at Dubbo.

These are considerations of which the dairy-farmer in the central west has yet to take full account. The adoption of winter dairying—to give it a definite name—involves, of course, certain changes in method, and change is a thing to which most of us accommodate ourselves but slowly. Definite methods of herd management, for instance, are necessary so that the cows shall freshen in the autumn and early winter. At present the bull is to be found running with the herd almost everywhere; if the most is to be made of the business the bull must have a paddock to himself. Then some conservation of fodder must be practised, and a crop-growing programme will have to be adopted to that end. These and various other necessary adaptations will gradually straighten themselves out.

It will be gathered that it is taken for granted that dairying will be largely associated with some other form of production. In certain favoured localities dairying may be the essential and prominent feature of the farm's activities, but what is in view for the most part is the mixed farm on which the cows are a valuable and well regulated feature of the whole.

The idea of combining dairying with lucerne-growing on the river flats of the Lachlan, and even on the banks of the Macquarie, may not occasion

much surprise, but that it should be associated with wheat-growing on ordinary wheat farms situated on upland country well away from rivers is another thing; yet that is exactly what is developing at the present time, and in the course of a recent trip through representative portions of the central west in company with Mr. E. Dalgleish, Dairy Instructor stationed at Orange, we had opportunity of learning the methods of a number of farmers under differing conditions.

As touching the issue just mentioned—the association of wheat-growing with milking cows—we may quote Mr. E. J. Bullock, of Bodangora, near Wellington. Farming 1,200 acres several miles from the Macquarie River and well above its level, he not only crops 500 to 600 acres for wheat every year (half of it being grown on fallow), and grazes 1,000 sheep most of the year round, but he also milks a herd of 30 cows. Needless to say, were this done by having the cows freshening in the spring, so that the milk flow was greatest when the wheat was being harvested, something would suffer, but Mr. Bullock manages his herd so that most of the cows calve in the autumn, and maximum milk flow then corresponds with the best time for feed and the season of least work on the other parts of the farm. When wheat harvest arrives some of the cows are becoming "strippers" and all of them are tending to give less milk. A machine-milking plant, power separator, and other conveniences enable him to put through the operation of milking in a minimum of time.

But all farms are not like this, and defects of method are common enough. How sound dairying is for this part of the State is evident in the fact that these men continue to feed and milk cows under such conditions, and are satisfied with the results. The Department makes a proposal that will certainly be more profitable, more convenient, and more secure. That that opinion is not departmental only may be illustrated by quoting a conversational remark of Mr. J. Clatworthy, of Coradgery, during the recent Agricultural Bureau Conference at Parkes: "With a practical experience of dairying on the Hunter," he said, "I am sure that, for the eight or nine cool months of the year in this part of the west, dairying is a sound proposition for the small man."

Conservation of Fodder.

Most of those who combine wheat and dairying, raise and store fodder crops of some kind. The hay stack or silage pit is their stand-by in periods of scarcity, their single anxiety at such times being that the water shall not give out. So congenial and easy on animals are these droughty periods that the dry feed on the paddocks will keep stock alive and milking for months, provided water is available. This feature, in fact, leads a few men to disregard even the conservation of fodder. Said one who milks 25 cows, but makes no hay except a small stack for the horses: "You will hit a drought, but if you are careful you will crawl over that, and it will educate you." That his cows were his pets and were milked in the yard with only a

pair of hobbles to hold them made no difference—conserved feed is not a necessity with him, though a nice even herd of Jerseys is his pride and pleasure.

How secure the country is and how little feed it takes to keep stock alive in the west in a dry spell, provided water is available, could hardly be better exemplified than in the way in which men who have had long experience there are prepared to carry a farm full of live stock—be they sheep or cattle—without any reserve whatever, being prepared to buy fodder during droughts if necessary.

Mr. J. Godwin's Jerseys in the yard.

It remains, however, that if a farmer will grow a bit of feed for storage either as hay or as silage he need never be short. Needless to say, this growth of fodder becomes the more imperative as areas become reduced. Large farms are hardly ever denuded of all feed, but the idea of running, say, 30 cows on 250 acres (which is the kind of proposition that will engage attention in the future) can only be practicable if fodder conservation is a regular part of the programme.

Among the lucerne-growers on the Lachlan flats, and also among those few who irrigate by power from the Macquarie, the use of the lucerne hay for the cows is generally scouted. The growers well know that the time is coming when such hay is going to be worth much money, and they rarely if ever feed it to their own stock, preferring to rely on the natural pasture.

Some, indeed, carry this to the extent of selling the hay in times of drought, and allowing their own animals to die. We came upon one farm with 30 acres of irrigated lucerne where in the last drought the stored hay was sold while the farm cows (about 30 of them) were allowed to wade deeper and deeper into the river, eating the river weeds, until they were so weak that they could not get back and died where they were. Yet on that farm cows

are reckoned so good a line that when the drought was over a herd of 17 animals was got together again, and dairying was resumed. The story is told, too, of a farmer near Blayney with over 100 cows and a machine plant who at the beginning of the last drought had a big stock of oaten hay. Prices for the hay soared, and those for the milking cows slumped. He sold the hay and let the cattle die. The year following the drought the price of butter was still fairly high owing to dry conditions on the coast, and another farmer not far away made £27 per month with nine cows. The wisdom of the first man's action is largely a matter of figures, but his herd had to be replaced at high prices that must have greatly discounted the profits on the oaten hay.

Three Classes of Farmers Interested.

Putting aside these ups and downs of the business there is undoubtedly an increasing number of men taking up dairying in the west. To three classes the development is likely to be particularly attractive.

The first is the small farmer already settled in the west. In the meantime this is the class of man who is most numerous among the suppliers, and largely because his limited area presses him in the direction of mixed farming To him the cows are essential as the channel by which a regular inflow of ready money enables him to live from month to month, awaiting the return from a few acres of crop. These men know the envious eyes cast in the direction of their few cows when the wheat crop fails, and the remarks about their luck, and they are not disposed to allow the advantage they have over their neighbours in periods of "drought" to slip through their fingers.

The second class in whose hands the movement is likely to spread is the coastal dairy-farmer who realises the possibilities of this country for the purpose. The ordinary "westerner" is apt to think of dairying as unending toil, but the experienced dairy-farmer on the coast does not so regard it. The day is coming when many such men will realise that the industry can be pursued in our western districts with more security, and above all with greater ease, and will transfer their activities accordingly. "Any coastal farmer who sees this country," said Mr. Dalgleish, "and who knows the advantages it offers would be glad to come here." One or two things will interest such men when they do so. The first is the appearance of the cattle. They are better grown, hardier, and healthier animals, and they stand well the more rigorous conditions of the west as their size and appearance well prove. The effect of western conditions upon dairy cattle is no new thing, of course. There are owners of pure-bred herds on the coast who send a large proportion of their young stock to western districts for a year or two with the specific object that they shall grow up under circumstances that will make for hardiness, health, and size. The western dairyman, on the other hand, knows that if by reason of shortage of feed drought reduces his herd it is the weaker animals that die, the fittest surviving for the reconstitution of the herd.

Another thing the coastal dairy-farmer will quickly appreciate in the west is the opportunity of getting a spell in the hottest period of the year, the heaviest of the work, *per contra*, falling in the cooler months. What a boon

that is, the dweller on the coast—used to long milkings of large herds in the humid heat of January and February—perhaps best knows. If in a year or two his success with the cattle is such as to justify an increase in area and a bit of cropping, he will, as we have said above, find that the crops mature when the milking is lightest.

A third class is manifesting a good deal of interest in dairying, and this comprises those who in the meantime are forwarding the largest consignments of cream. These are farmers engaged in wheat-growing on a fair scale. One or two representatives of this class we have already quoted. Their areas run from 300 acres to 1,200 acres or even more, and they are men who value the manner in which the two industries can be combined. They are not dependent on their cattle to keep things going in a bad spell, as are the men in the first class, but they know the dairy is a profitable side-line and are not likely to drop it. Numerically they may not increase very rapidly, but as the success of the small mixed farmer becomes more apparent, more and more of the men on larger areas will be found running a few milkers.

Western Factors that Affect Cream Quality.

Before turning to some details regarding the farms visited it may be useful to point out a few further features of dairying under western conditions.

To some familiar with the cooler conditions of the coast the objection doubtless occurs that the cream must suffer from the higher temperatures. Account must, however, be taken of the drier atmospheric conditions. These are so much in favour of quality that, providing the cream receives due care on the farm, it can be carried distances by rail and by road that could hardly be contemplated under coastal conditions. Among the best cream received at Dubbo factory, we were assured, are a couple of consignments that come forward two or three times a week from Trangie. Both come from men who were previously dairying on the coast, and who, having moved into western districts, have recognised the value of the country for the purpose. The factory manager at the same centre quoted a supplier ten or eleven miles out who had not "had two cans of inferior cream in five years," though he could only deliver two or three times a week. Think of that, you coastal dairy-farmers, who live only a mile or two from the factory, and deliver every day—but yet get "second grade" quite often!

On the other hand, even western dairy-farmers require to give attention to the care of their cream. A sweet, clean atmosphere in the dairy is easily secured under these conditions, but cleanliness as to the utensils is as essential here as anywhere. Injurious methods such as the mixing of hot cream with cold must be avoided as much as on the coast; perhaps it is even more harmful here owing to infrequent delivery to the factory. At Parkes factory they had one supplier whose cream was so frequently graded down that the buttermaker interested himself in the matter, with the result that the cause was discovered, and the supplier now keeps the hot cream separate from the cold for two or three hours, with such beneficial results that the grading has been "choicest" ever since.

A desire to save money in railway freight is another frequent cause of loss in quality—and a very poor economy, too, for to keep a can of cream on the farm a day too long may result in the grading down of the whole. On a can of 50 lb. of cream the freight may be 1s. or 1s. 3d., while the loss by grading "second" at 3d. per lb. of butter will amount to 6s. 3d. If the cream were sent forward in two batches, the extra freight would only be another 1s. to 1s. 3d., so that there would be a direct gain of 5s. on such a consignment.

A few machine-milking plants are to be found. Mr. Dalgleish, the Dairy Instructor, does not hesitate to commend the bucket type of plant to farmers as the one that is easiest kept clean. The releaser system does, of course, eliminate the lifting into the vat, but the cleansing of the rubber tubes twice a day is a task from which even careful men shrink. With the bucket system, too, the flow of milk into the bucket can be constantly watched, and quality can be more easily ensured. One otherwise excellent farmer was found who only cleaned the tubes with the brush once a week, which is quite insufficient.

(To be continued.)

A New Regulation under the Stock Brands Act.

THE Minister of Agriculture directs attention to the repeal of Regulation 10 made under the Registration of Stock Brands Act, 1921, and Registration of Stock Brands (Amendment) Act, 1923, and published in the *Government Gazette* of 26th September, 1924, and the making in lieu of it of the following regulation:—

10. No person other than a proprietor of a registered brand shall use a distinctive brand. No person shall use a distinctive brand in which there is any numeral less than 1 inch in length or in which the numerals, if more than one, are less than half an inch apart. Distinctive brands shall not be used on any position other than the left neck, left cheek, right cheek, left saddle or right saddle of horses or left neck, left cheek, or right cheek of cattle: Provided that—

(a) Horses registered in the Australian Stud Book may be branded with distinctive brands on the right shoulder or right thigh if these positions do not already bear a registered brand; and

(b) Cattle registered in a Stud Book of any of the following societies, viz., the Australian Jersey Herdbook Society, Milking Shorthorn Herd Society of Australia, Illawarra Milking Shorthorn Society of Australia, Guernsey Cattle Society of Australasia, Friesian Cattle Society of Australia, Ayrshire Cattle Society of Australasia, Shorthorn Cattle Society, Stud Beef Cattle Breeders' Association of Australia, and Guernsey and Guernsey Grade Cattle Society of New South Wales, may be branded with distinctive brands on any portion of the animal other than a position specified in Schedule II to the Registration of Stock Brands Act, 1921, as amended by the Registration of Stock Brands (Amendment) Act, 1923.

Stachys arvensis: A Cause of Staggers or Shivers in Sheep.

H. R. SEDDON, D.V.Sc., Director of Veterinary Research, Glenfield.

THE terms "staggers" and "shivers" are used commonly in New South Wales to denote a non-contagious affection of sheep, occurring especially in certain districts of the State, wherein animals, apparently normal when seen in the paddock or pen, exhibit, on being driven, a staggery gait and symptoms best described by the term "shivers," the affection coming on more or less suddenly.

Though known for many years and believed to be of dietetic origin, such was not proved until in 1920 Dodd and Henry[1] showed that the condition could be induced by placing animals on an exclusive diet either of *Malva parviflora* (marshmallow) or of *Lamium amplexicaule.*

A third plant, *Stachys arvensis*, had long been suspected, and so deep-rooted was this belief that the weed is commonly known in New South Wales by the name "stagger weed," and not by its popular English name of "hedge nettle." Basing his opinion upon the results of some experiments wherein horses and guinea pigs were fed on the plant, Stanley[2] concluded that it was not responsible for the condition. Maiden[3], after detailing the popular opinion of the weed and pointing out that it has been known in England and Europe for centuries without its ability to produce staggers being recognised, sums up by concluding that "the plant is probably harmless enough." Ewart[4], after recalling the fact that the plant belongs to an order including no less than 3,000 species (and a genus of over 200), none of which are recognised as poisonous, concludes that the explanation is that "some ignorant person corrupted the name *stachys* weed into stagger weed, and hence by association of ideas the plant was held responsible for the disease.' Bailey[5] also records the fact that popular experience in Queensland blames the weed as a cause of staggers.

Dodd and Henry, in the course of their investigations on staggers, arranged for certain feeding tests with *Stachys arvensis* to be undertaken. These were carried out by Mr. Hindmarsh, B.V.Sc., Government Veterinary Surgeon. The first was at Moss Vale in 1920, when three old sheep were fed on the weed. The animals did not eat the plant very readily, and in consequence two at least seem to have become rather weak. They were tested by driving on several occasions the following facts being noticed:—The sheep showed marked signs of urinary irritation, accompanied in two cases by a trembling of the muscles of part of the body. The marked stiffness of the limbs observed with mallow and *Lamium* was not seen in these cases. One of the sheep became very weak, and died, and another, too

weak to travel, was killed. The third sheep readily knocked up when driven. As these results were somewhat inconclusive, a further test of the plant was made by Mr. Hindmarsh in October, 1922. These experiments were entirely negative.

Experimental Work.

In view of the foregoing, it was deemed desirable to undertake further feeding tests, and moreover, to conduct these both at the Glenfield Veterinary Research Station and in the locality from which the supplies of the plant were to be drawn. It was found that considerable supplies of the weed were procurable at Narara, and to Mr. W. L. Hindmarsh was entrusted the duty of carrying out the feeding tests decided upon for that centre, facilities for keeping the experimental animals having been obtained at the Viticultural Station.

Simultaneously with these experiments, supplies of the weed were despatched daily to the Research Station. The feeding experiments were begun at Narara on 26th September, and at Glenfield on 11th October 1923. For the experiments conducted at Glenfield, Merino ewes from a district wherein staggers does not occur, were employed, but for the Narara experiments the sheep were bought at the saleyards and their origin was unknown. As a result of these experiments the following conclusions were arrived at :—

1. Continued ingestion of the weed produces the condition known as staggers or shivers.
2. The effects are manifested more readily in lambs than in adult sheep.
3. Symptoms may appear after four and a half days feeding, or may be delayed for anything up to forty days.
4. The severity of the symptoms and the length of feeding required before such a symptom as shivering occurs is subject to considerable variation, and is related apparently to the age of the plant, which appears more toxic when young, green, and succulent than when older, yellowish, and somewhat harsh.
5. The symptoms vary from lagging or "knocking up" to a distinct staggering gait and shivering attacks. Another prominent symptom is that of urinary irritation, animals straddling frequently and voiding a few drops of urine.
6. Sheep may recover within a few minutes of a severe attack and thereafter travel normally, but generally, following an attack, animals knock up, and enforced exercise is liable to have fatal consequences.
7. Sheep ingesting the plant may be found dead with few or no premonitory symptoms, and such may occur even though the animal has not shown actual shivers.
8. The staggers-producing principle is transmitted through the milk of the dam.
9. Taken off the weed, sheep rapidly recover.

It thus appears that one must recognise three plants, namely, *Malva parviflora*, *Lamium amplexicaule*, and *Stachys arvensis*, as each capable of causing staggers in sheep. Their general effects are much the same, but it would appear that the symptom of staggers is much more commonly seen following ingestion of *Malva parviflora* and *Lamium amplexicaule*, and that shivering and urinary irritation are more marked features resulting from *Stachys arvensis* intoxication. In all cases, however, the net result is inability of the animal to travel.

The explanation of the fact of the non-recognition of the harmfulness of these old world plants is, no doubt, that in their native lands conditions are such that sheep would not receive them to the exclusion of other fodder.

Symptoms Induced.

The most definite symptoms observed were shown by lambs, and the general sequence and manner of onset of these was as follows:—

In the pen the animals appeared quite normal, full of vigour, and eating and drinking in a natural manner. Allowed out into the paddock, they would run through the gate for 50 yards or so, and then graze. When driven they would travel at first at the irregular rate common to fresh sheep, stopping to graze if allowed to do so, but later would settle down to walk at a steady pace. Sooner or later (and these symptoms might appear almost at the commencement of the driving), the affected animals lag behind the rest of the flock. Such "lagging" might occur suddenly, and more severe symptoms supervene almost immediately, or it might come on more slowly and be the only symptom observed. At such times the animal holds its head low, and the back is somewhat arched. Allowed to stand, symptoms of uneasiness are manifested, the animal shifting its feet continually and frequent micturition occurring. These symptoms of uneasiness and urinary irritation may be accompanied or preceded by a staggering gait, and such may occur without any preliminary lagging.

During the period of uneasiness affected sheep may "shiver" or tremble violently, and, though the shivering affects all parts of the body, the muscles of the hindquarters are generally those in which it is most marked. These shivering attacks are usually of short duration, lasting generally from twenty to thirty seconds, and thereafter the animal may quickly recover and rejoin the flock. At other times the animal lies down, and this tendency to lie down is often very marked, also in those which have shown no more pronounced symptoms than persistent lagging. Whilst down any manipulation often leads to a recurrence of the shivering, the animal appearing hyperaesthetic. There is some ground for believing that shivering attacks may sometimes be excited by forced exercise of those animals which show uneasiness and urinary irritation. Forced exercise after lagging and knocking up or shivers is liable to lead to sudden death of the animal.

After a shivering attack an animal will, if allowed to rest, generally recover, and may travel for several hundred yards further, but usually if kept moving additional shivering attacks are manifested. If exercise is enforced on such an animal it will quickly assume a recumbent position, lying on its brisket, or in more severe cases outstretched, the respirations being accelerated and the pulse very rapid. Placed on its feet the respiration rate frequently slows markedly, and such may also occur suddenly if the animal is allowed to rest. When moved, especially if hurried, however, the respirations again become accelerated.

At other times, particularly after several attacks, an affected lamb may appear dull and not easily roused. Consciousness is unimpaired, and peculiarly enough within five seconds of a violent attack of shivers a lamb may start grazing.

In the lambs, death has generally occurred comparatively suddenly, being preceded by only a short period of extreme dullness, but no coma. In the case of one ewe several violent shivering attacks, accompanied by gnashing of teeth, salivation and marked urinary irritation, occurred at frequent intervals, and were of such an intensity that they might be considered to be rigors.

Effect of the Weed at Different Stages of Growth.

It was not found possible to test the weed in the non-flowering stage, for at the time of the commencement of these experiments the greater number of plants were in flower, some even seeding. It was, however, green and succulent, and it should be noted that it was then that symptoms were readily induced in the adult sheep. Later the plant became drier and assumed a yellowish colour, and at that stage only the lambs showed symptoms of shivers, except one ewe, which animal, it should be noted, was given the weed *ad libitum.* The amounts of weed necessary to induce symptoms in lambs was very much greater when the wilting, yellowish plant was fed, than with the succulent, green weed fed earlier in the season. As the feeding was at the same rate, symptoms were correspondingly later in appearing.

Further work is in progress to determine just why the effects of this weed vary so greatly, and will be the subject of a future article.

References.

[1]Dodd, S., and Henry, M.—Science Bulletin, No. 23, 1923, N.S. Wales Dept. Agr.
[2]Stanley, E.—*Agric. Gazette* of N.S. Wales, January, 1895.
[3]Maiden, J. H.—"The Weeds of New South Wales," p. 72.
[4]Ewart, A. J.—"The Weeds, Poison Plants, and Naturalised Aliens of Victoria," p. 52.
[5]Bailey, F. M.—"The Weeds and Suspected Plants of Queensland," p. 146.

A full account of the investigational work appears in Science Bulletin No. 24, Veterinary Research Report No. 1, of the Glenfield Veterinary Research Station just published.

Apiary Notes.

W. A. GOODACRE, Senior Apiary Instructor.

As the importation of Italian bees from Italy, owing to the distance for shipping, is rather a troublesome and risky business, Mr. Beuhne of the Victorian Department of Agriculture, has evolved a plan whereby select strains of Italian bees could be placed on islands near Australia, whence beekeepers could in future obtain queens from select breeding stations, thus saving the trouble and expense of importing them from Italy.

The islands selected were, Groote Island in the Gulf of Carpentaria, and Nauru in the Pacific. These islands contain a good deal of flora, and no bees had been previously introduced to them.

The first colony of bees sent to Groote Island was successfully established, but owing to some mismanagement later the colony was destroyed. Another attempt was made recently in which the Agricultural Departments of New South Wales and Victoria, in conjunction with the Apiarists' Associations, co-operated. The special hive for transport was prepared by the Victorian Department of Agriculture, the queen and bees were supplied from the Wauchope Apiary, and preparation and shipment were arranged by Hawkesbury Agricultural College. The Apiarists' Association assisted in the financial part of the scheme.

This second attempt was successful, and the latest news from the Mission Station where attention is given the bees is that the bees are doing well and have increased to three colonies.

The Department of Agriculture in Victoria has been successful in getting a colony of select Italian bees established in Nauru Island.

To allow the bees to distribute over these exclusive breeding stations, the Federal Government was asked to give protection covering a period of ten years to prevent exploitation. The matter was put before the Conference of Ministers of Agriculture recently held in Sydney, and the necessary protection asked for has now been given.

The Honey Market.

According to a recent market report, there has been difficulty in keeping the price of best quality honey up to 5d. per pound. One large firm, so the report says, has endeavoured to place single tins at 5d. per pound, but others are not inclined to come into line. This position is surely due to insufficient co-operation amongst apiarists. Best grade honey should not go below 5d. during a season such as this one, or even during a season of heavier production.

If beekeepers are prepared to go on leaving the manipulation of the market to the city merchants, having no say in the matter themselves, then they are in for a bad time next season, which promises to exceed this one for honey production. It is due, to a large extent, to the efforts of a number of

progressive apiarists in the co-operative movement that some satisfaction in the marketing of produce during the few previous seasons has been obtained. These men require more encouragement, which brings us to the question whether it would be a good plan to introduce some compulsory method whereby producers would be forced to assist in the betterment of marketing conditions.

WINTER SCHOOL FOR FARMERS, 1925.

ARRANGEMENTS have been made for the annual Winter School for farmers to be held at Hawkesbury Agricultural College from 23rd June to 18th July next. The syllabus covers a comprehensive course of lectures and demonstrations on agriculture, horticulture, live-stock, &c., and in addition, practical training is available in useful work connected with farm life, such as saddlery, engineering, blacksmithing, carpentry, &c.

To meet a popular demand, a special school will be held for those who desire to specialise in the subject of poultry-farming. All branches of the industry will be fully dealt with, and moreover, the students will be given an opportunity of studying such subjects in the general course as are likely to be of value to them.

Farmers and youths over 16 years of age who have been engaged in rural work for at least one year will be eligible for admission to the general course, and admission to the poultry course will be granted to persons of either sex over the age named who are engaged in poultry-farming.

Applications for both schools will close on 31st May, 1925.

The fee for either course, inclusive of board and lodging, will be £5 5s. Prospectus and full information may be obtained on application to the Under-Secretary and Director, Department of Agriculture, Sydney.

TOO MANY VARIETIES.

ONE of the severest handicaps to the organisation of the industry by the establishment of packing sheds in the deciduous fruit-growing districts of the State is the vast number of varieties the different orchards are producing. Even with new plantations the same short-sighted methods are being followed. Doubtless poor market returns will, sooner or later, compel the rooting out of undesirable varieties, but in the interests of the industry and the individual how much better it would be to establish some recognised authority to direct and curtail, if necessary, the varieties planted !—A. W. TONKING, at the Agricultural Bureau Conference at Parkes.

RETURN OF INFECTIOUS DISEASES REPORTED IN MARCH.

THE following is the return of outbreaks of the more important infectious diseases reported during the month of March, 1925 :—

Anthrax	2
Contagious pneumonia of swine	1
Pleuro-pneumonia contagiosa	Nil.
Piroplasmosis (tick fever)	,,
Swine fever	,,

—MAX HENRY, Chief Veterinary Surgeon.

Egg-laying Tests at Hawkesbury Agricultural College.

(Under the Supervision of James Hadlington, Poultry Expert.)

Twenty-third Year's Results, 1924–25.

F. H. HARVEY, Organising Secretary.

The Twenty-third Egg-laying Competition at Hawkesbury Agricultural College commenced on 10th April, 1924, and terminated on 31st March, 1925, a period of 356 days. The reason for opening the competition on 10th April is that it was possible to remove from the pens the birds from the last competition and allow the new entrants to be placed direct into their pens.

The competition was controlled by a committee of management, comprising four officers of the Department of Agriculture and three competitors' representatives, namely, the College Principal (Mr. E. A. Southee), Messrs. James Hadlington (Poultry Expert, Department of Agriculture), C. Lawrence (Poultry Instructor, Hawkesbury Agricultural College), C. Judson, J. H. Madrers, and R. B. Kenway (competitors' representatives), and F. H. Harvey (Department of Agriculture), Organising Secretary.

Scope of the Competition.

The competition embraced four sections, namely, open sections for light and heavy breeds, and standard sections for light and heavy breeds. This marks the sixth year in which competitions were provided for standard-bred birds, the qualification for entry in these sections being that the owner had won a first, second or third prize with the particular breed entered in an "open show class" at an approved exhibition held in New South Wales during the previous three years.

The competitions were limited to pullets between 7 and 12 months old on 1st April, 1924, and pens were allotted as follows:—

	Groups.	Birds.
Section A.		
Open Light Breeds:—		
White Leghorns ...	57	342
Section B.		
Open Heavy Breeds:—		
Black Orpingtons ..	17	102
Langshans	5	30
Plymouth Rocks ...	1	6
Section C1.		
Standard Light Breeds:—		
White Leghorns ...	3	18
Buff Leghorns	1	6
Exchequer Leghorns ...	1	6
Section C2.		
Standard Heavy Breeds:—		
Langshans	3	18
Rhode Island Reds ...	1	6
Black Orpingtons ...	1	6
Total	90	540

Weight of Eggs.

The regulation that individual hens must lay eggs of at least 2 oz. each, and that eggs from groups must average at least 24 oz. per dozen within four months of the commencement of the competition in order to be eligible for prizes, resulted in the disqualification of eight individual hens and one group, as follows:—

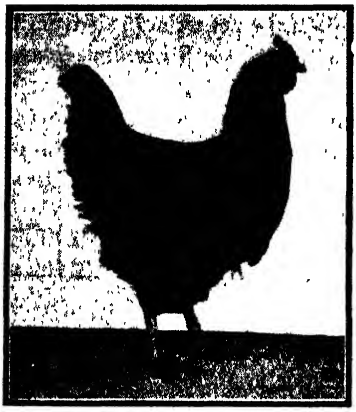
Disqualified from Individual Prizes.

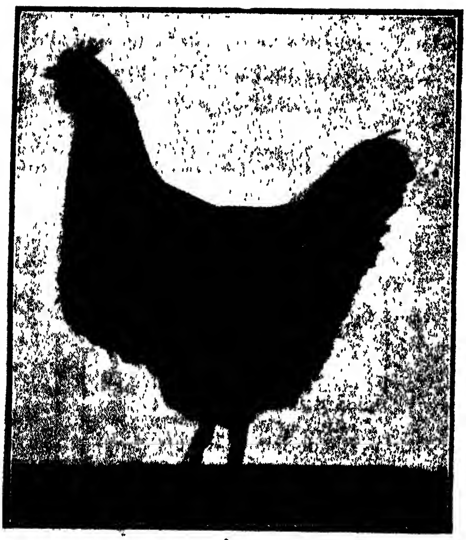
Light Breeds.—K. G. Cobcroft (No. 200), H. J. Cox (No. 214), Williamson and Pearce (Nos. 501, 504), W. C. Revie (No. 508).

Heavy Breeds.—R. B. Kenway (No. 33), A. R. Wheatley (No. 95), J. D. Martin (No. 134).

Disqualified from Group Prizes

Light Breeds.—Williamson and Pearce.





A

Three of Messrs. Judson and Son's Group of Black Orpingtons.

Winner of Grand Champion Prize for group of six birds laying eggs of greatest market value. Total, 1,558 eggs.

A.—This hen laid 330 eggs in the 356 days of the competition, and completed 365 days with 337 eggs—a record for the College competitions.

Prices of Eggs.

The prices of eggs, calculated to the nearest penny, from the account sales received at the College for sale of the competition eggs, were as follows:—

Month	Price per doz. s.	d.	Month	Price per doz. s.	d.
April, 1924	2	9	October, 1924	1	4
May, ,, ...	3	0	November, ,, ...	1	5
June, ,, ...	2	5	December, ,, ...	1	6
July, ,, ...	2	2	January, 1925	1	7
August, ,, ...	1	5	February, ,, ...	1	9
September, ,, ...	1	4	March, ,, ...	2	4

The Financial Aspect.

The cost of feed for the 540 birds for the year was £266 15s. 2d. representing:—

			£	s.	d.
Wheat	370 bushels	24 lb. ..	128	0	6
Maize	143 ,,	8 ,, ...	38	3	6
Pollard	745 ,,	10 ,, ...	53	2	5
Bran	372 ,,	15 ,, ...	23	4	3
Meat meal...	14 cwt.	13½ ,, ...	12	10	8
Salt...	265 lb.	12 oz. ...	1	1	1
Shell grit	1 ton	15 cwt. ...	6	3	7
Green feed	82 cwt.	... ...	4	2	0
Epsom salts	51 lb. ...	... ...	0	7	2

The average cost of feed per head was thus 9s. 11d.

Mortality and Disease.

The mortality for the year was slightly lower than in the preceding year, being twenty-nine, as compared with thirty. The details were:—

	1923–24.		1924–25.	
	Light Breeds.	Heavy Breeds.	Light Breeds.	Heavy Breeds.
Birds replaced	1	2	10	0
Birds not replaced	13	14	15	4

The Monthly Laying.

Month.	Section A. Open Light Breeds.		Section B. Open Heavy Breeds.		Section C1. Standard Light Breeds.		Section C2. Standard Heavy Breeds.	
	Total for 342 hens.	Average per hen.	Total for 188 hens.	Average per hen.	Total for 30 hens.	Average per hen.	Total for 30 hens.	Average per hen.
April, 1924 ..	2,470	7·2	1,080	7·8	174	5·8	340	11·3
May, ,, ..	4,452	13·0	2,191	15·9	249	8·3	584	19·5
June, ,, ..	6,041	17·7	2,699	19·6	370	12·3	592	19·7
July, ,, ...	6,430	18·8	2,919	21·2	505	16·8	635	21·2
August, ,, ...	7,124	20·8	3,125	22·6	612	20·4	660	22·0
September, ,, ...	7,452	21·8	3,114	22·6	641	21·4	553	18·4
October, ,, ...	7,888	23·1	3,059	22·2	665	22·2	537	17·9
November, ,, ...	7,367	21·5	2,552	18·5	600	20·0	392	13·1
December, ,, ...	6,956	20·3	2,465	17·9	566	18·9	430	14·3
January, 1925 ...	6,490	19·0	2,162	15·7	461	15·4	398	13·0
February, ,, ...	5,373	15·7	1,874	13·6	340	11·3	326	10·9
March, ,, ...	4,321	12·6	1,866	13·6	205	6·8	314	10·4
Total	72,364	211·6	29,106	210·9	5,388	179·6	5,751	191·7

Annual Competition.

Full details of the financial and other results since the inception of the competitions are given in the following comparative table :—

		No. of Groups.	Winning Total.	Lowest Total.	Highest Monthly Total.	Average per Hen.	Average Net Price of Eggs.	Average Value per Hen.	Cost of Feed per Hen.	Balance over Feed.
1st ...		38	1,113	459	137	130	1/1	15/6	6/-	9/6
2nd ...		70	1,308	666	160	163	1/3¾	17/9	5/9¾	12/-
3rd ...		100	1,224	532	154	152	1/-	12/9	4/5½	8/3
4th ...		100	1,411	635	168	166	-/11⅓	13/3	5/3½	8/-
5th ...		100	1,481	721	162	171	1/0½	14/10	5/10	9/-
6th ...		60	1,474	665	161	173	1/2¼	17/2	7/-	10/2
7th ...		50	1,379	656	159	180	1/3¼	19/2	7/9½	11/4
8th ...		60	1,394	739	158	181	1/5¼	21/9	6/9	15/-
9th ...		40	1,321	658	151	168	1/2	16/3½	6/5½	10/2
10th ...		50	1,389	687	146	184	1/2½	18/5½	6/1½	12/4
11th ...		50	1,461	603	156	178	1/3½	19/4¼	7/3½	12/0¾
12th ...		50	1,360	724	152	177	1/2½	17/7	5/9	11/10
13th ...		63	1,541	705	162	181	1/2	17/8½	6/9½	10/11
14th ...		70	1,449	506	165	192	1/4⅓	22/2	7/7	14/7
15th	A	40	1,526	924	162	216	1/3¾	28/8¾	6/10	16/10¼
	B	30	1,479	749	165	192	1/3¾	21/7½	6/10	14/9½
16th	A	40	1,525	923	157	209	1/4	21/9¾	7/8	14/1¾
	B	30	1,613	931	170	202	1/4	21/2	7/8	13/6
17th	A	40	1,448	860	153	199	1/5½	22/0½	7/10	14/2½
	B	30	1,517	815	151	189	1/5½	21/11¼	7/10	14/1¼
18th	A	30	1,438	988	148	203	1/10	28/10	9/3	19/7
	B	50	1,428	745	151	190	1/10	28/1	9/3	18/10
	C1	3	1,304	977	138	195	1/10	27/8	9/3	18/5
	C2	7	1,336	955	150	191	1/10	28/5	9/3	19/2
19th	A	33	1,516	996	167	206	2/2	37/11	12/8	25/3
	B	47	1,488	955	168	204	2/2	37/11	12/8	25/3
	C1	5	1,425	944	148	195	2/2	36/-	12/8	23/4
	C2	5	1,298	1,020	150	193	2/2	35/9	12/8	23/1
20th	A	45	1,480	881	157	196	1/11	30/10	11/9	19/1
	B	35	1,457	696	160	192	1/11	31/2	11/9	19/5
	C1	5	1,092	885	144	168	1/11	24/7	11/9	12/10
	C2	5	1,370	1,092	147	197	1/11	33/5	11/9	21/8
21st	A	50	1,425	646	164	195	1/9	28/5	10/10	17/7
	B	30	1,417	720	164	188	1/9	27/5	10/10	16/7
	C1	5	1,220	864	149	176	1/9	25/8	10/10	14/10
	C2	5	1,212	931	144	187	1/9	27/3	10/10	16/5
22nd	A	50	1,508	942	161	210	1/6	26/3	9/9	16/6
	B	30	1,600	871	164	203	1/6	26/3	9/9	16/6
	C1	5	1,307	692	142	170	1/6	21/1	9/9	11/4
	C2	5	1,430	1,052	152	205	1/6	26/9	9/9	17/-
23rd	A	57	1,470	961	160	212	1/8	28/7	9/11	18/8
	B	23	1,558	1,006	164	211	1/8	29/2	9/11	19/3
	C1	5	1,291	950	146	180	1/8	23/5	9/11	13/6
	C2	5	1,308	1,049	159	192	1/8	27/5	9/11	17/6

Scores of Leading Birds.

The following table shows the monthly totals of the eight leading scores in the light and in the heavy breeds :—

Owner and Breed.	April.	May.	June.	July.	August.	September.	October.	November.	December.	January.	February.	March.	Total.
						Light Breeds.							
K. G. Cobcroft : White Leghorn ..	14	25	27	23	25	27	30	28	28	25	24	26	*302
G. N. Mann : White Leghorn	8	25	25	25	25	27	28	28	28	29	24	26	298
H. Cole : White Leghorn .	15	23	24	25	25	27	27	26	24	25	28	26	295
D. Asher : White Leghorn . . .	17	25	21	25	24	26	28	24	27	21	26	28	292
A. Hughes : White Leghorn . .	18	25	25	25	24	26	25	24	23	22	21	25	283
A. Hughes : White Leghorn	14	23	23	22	25	24	26	27	25	24	24	25	282
P. R. Barsby : White Leghorn ..	8	24	25	26	27	28	29	26	29	25	21	12	280
H. S. Crear : White Leghorn	1	22	24	24	25	26	28	29	29	26	22	24	280
						Heavy Breeds.							
C. Judson & Son . Black Orpington	18	24	29	31	30	30	31	29	31	27	24	26	330
W. Townsend : Langshan .	18	27	29	26	26	27	27	26	28	28	20	29	*311
G. Jobling & Son : Black Orpington ..	12	26	25	28	26	25	23	29	28	24	25	28	299
T. McDonald : Black Orpington	14	24	24	27	28	28	29	28	28	26	22	21	299
W. M. Mulliner : Black Orpington .. .	12	31	29	28	26	30	26	26	26	22	21	21	298
A. R. Wheatley : Black Orpington .. .	1	27	26	27	27	29	28	24	27	30	23	29	298
J. Every : Langshan	15	21	22	21	25	27	30	27	27	29	25	24	293
R. B. Kenway : Black Orpington . .	12	21	27	28	28	30	30	23	23	25	20	22	289

* Eggs under standard of 24 oz. per dozen.

Weights of Winning Birds.

The weights of the winning birds at the beginning and end of the competition should be of interest. They were :—

		Weight at April, 1924.		Weight at March, 1925.	
Groups.		lb.	oz.	lb.	oz.
Light Breeds—					
A. Hughes' White Leghorns, Nos. ...	307	3	14	4	0
	308	4	0	4	2
	309	4	2	4	4
	310	4	0	4	2
	311	4	0	4	4
	312	3	14	4	6
Heavy Breeds—					
C. Judson and Son's Black Orpingtons, Nos.	43	5	12	5	10
	44	6	4	6	8
	45	6	6	7	8
	46	5	10	6	8
	47	6	2	7	6
	48	5	10	7	8
Individual Hens.					
Light Breeds—					
G. N. Mann's White Leghorn, No. 370 ...		3	10	3	11
Heavy Breeds—					
C. Judson and Son's Black Orpington, No. 47		6	2	7	6

Averages of Breeds.

No. of Birds.	Breed.	Eggs per Hen.	Weight of eggs per dozen.	Value per Hen.
		Open Light Breeds.	oz.	£ s. d.
342	White Leghorns	212	25½	1 8 7
		Open Heavy Breeds.		
102	Black Orpingtons	210	25½	1 9 0
30	Langshans	203	25½	1 10 8
6	Plymouth Rocks	177	24	1 2 10
		Standard Light Breeds.		
18	White Leghorns	190	25½	1 4 11
6	Buff Leghorns	168	23½	1 1 5
6	Exchequer Leghorns	158	24	1 0 7
		Standard Heavy Breeds.		
18	Langshans	194	25½	1 8 4
6	Black Orpingtons	200	26½	1 8 4
6	Rhode Island Reds	175	26	1 3 8

AWARD OF PRIZES.

GRAND CHAMPION PRIZE, £5 5s., for group of six birds laying eggs of greatest market value—C. Judson and Son (Black Orpingtons), 1,558 eggs ; market value, £10 14s. 4d.

SPECIAL PRIZES.

Special prizes donated by Messrs. Judson and Madrers for individual hens (light and heavy breeds), which first lay 200 eggs, birds owned by the donors to be excluded—W. M. Mulliner (Black Orpingtons), £2 2s. H. Cole and P. R. Barsby (White Leghorns), £2 2s. Divided.

Agricultural Department's Special Prize for any group or hen whose laying is a record for the Competition—C. Judson and Son (Black Orpington) 330 eggs, £3 3s.

GROUPS OF SIX BIRDS.

Light Breeds :—A. Hughes (White Leghorn), 1,470 eggs, £3 ; F. T. Wimble (White Leghorn), 1,464 eggs, £2 10s. ; H. J. Cox (White Leghorn), 1,456 eggs, £2 ; Longworth and Cuthbert (White Leghorn), 1,451 eggs, £1 10s. ; B. L. Blake (White Leghorn) 1,435 eggs, £1.

Heavy Breeds :—C. Judson and Son (Black Orpington), 1,558 eggs, £3 ; J. H. Madrers (Black Orpington), 1,511 eggs, £2 10s. ; J. Every (Langshan), 1,496 eggs, £2 ; T. McDonald (Black Orpington), 1,432 eggs, £1 10s. ; A. R. Sinclair (Langshan), 1,376 eggs, £1.

INDIVIDUAL HENS.

Light Breeds :—G. N. Mann (White Leghorn), 298 eggs, £2 10s. ; H. Cole (White Leghorn), 295 eggs, £2 ; D. Asher (White Leghorn), 292 eggs, £1 10s. ; A. Hughes (White Leghorn), 283 eggs, £1.

Heavy Breeds :—C. Judson and Son (Black Orpington), 330 eggs, £2 10s. ; W. Townsend (Langshan), 311 eggs, £2 ; G. Jobling and Son (Black Orpington), 299 eggs, and T. McDonald (Black Orpington), 299 eggs, divide third and fourth prizes, £1 10s. and £1.

QUARTERLY PRIZES (Groups of Six Birds).

Winter tests (10th April to 30th June, 1924)—
Light Breeds :—A Hughes, 324 eggs, £2 ; F. T. Wimble, 311 eggs, £1 10s.
Heavy Breeds :—W. Townsend, 373 eggs, £2 ; J. H. Madrers, 364 eggs, £1 10s.

Spring test (1st July to 30th September, 1924)—
Light Breeds :—H. J. Cox, 420 eggs, £1 10s. ; H. S. Crear, 417 eggs, £1.
Heavy Breeds :—V. J. Winn, 468 eggs, £1 10s. ; C. Judson & Son, 450 eggs, £1.

Summer test (1st October to 31st December, 1924)—
Light Breeds :—B. L. Blake, 445 eggs, £1 10s. ; H. L. Abrook, 444 eggs, £1.
Heavy Breeds :—C. Judson & Son, 427 eggs, £1 10s. ; T. McDonald, 417 eggs, £1.

Autumn test (1st January to 31st March, 1925)—
Light Breeds :—C. Judson & Son, 366 eggs, £2 ; J. Every, 332 eggs, £1 10s.
Heavy Breeds :—G. N. Mann, 384 eggs, £2 ; F. T. Wimble, 371 eggs, £1 10s.

QUALITY PRIZES.

For groups in open sections, selected as conforming most to standard type, and which lay 1,200 eggs or more :—

Light Breeds :—F. G. Lombe, 1,404 eggs, £5; L. A. Ellis, 1,380 eggs, £2 10s.
Heavy Breeds :—C. Judson & Son, 1,558 eggs, £5; J. H. Madrers, 1,511 eggs, £2 10s.

For groups in standard sections, laying the greatest number of eggs, with minimum of 1,100 eggs :—

Light Breeds :—P. R. Barsby, 1,291 eggs, £2; L. A. Beckett, 1,151 eggs, £1
Heavy Breeds :—W. Townsend, 1,308 eggs, £2; W. M. Mulliner, 1,201 eggs, £1.

HIGHEST AVERAGES.

Groups of six or five birds—

Light Breeds :—A. Hughes, average 245 eggs, £3; F. T. Wimble, average, 244 eggs, £2 10s.; H. J. Cox, average 243 eggs, £2; Longworth and Cuthbert, average 242 eggs, £1 10s.

Heavy Breeds :—C. Judson & Son, average 260 eggs, £3; J. H. Madrers, average 252 eggs, £2 10s.; J. Every, average 249 eggs, £2; T. McDonald, average 239 eggs, £1 10s.

THE POULTRY EXPERT'S COMMENTS.

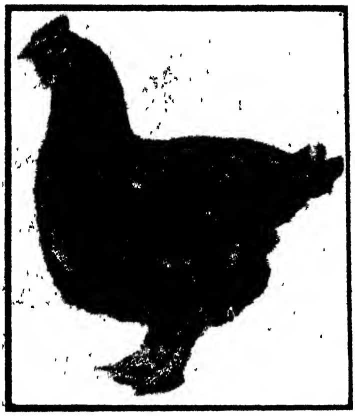
The general average put up in these competitions appeals to me as the most important factor in connection with them. It is the best barometer indicating the progress or otherwise of egg production. It is therefore good to see a return to a higher average than has been obtained since 1918, which up to now has stood as a record for the Hawkesbury Agricultural College. The general average of all sections in that test was 206·4.

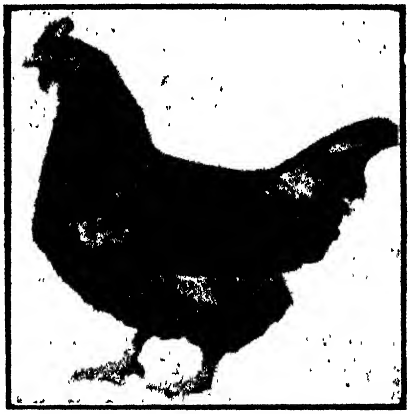
It is most satisfactory to find the average of this competition exceeds that record by 2·1, it being 208·5. The leading hen (No. 47), which is also one of the leading group, has put up the very fine performance of 330 eggs in 356 days with nine days to go to complete the year. This also constitutes a record for the Hawkesbury Agricultural College for a single hen. The

Two of Mr. A. Hughes' Group of White Leghorns.

Greatest number of eggs (1,470) in the Open Light Breeds Section. A.—This bird laid 263 eggs.

incidence of the laying of this hen is worthy of mention. The 200-egg mark was reached on 8th November and the 300th egg was laid on 26th February, the 318th day of the test. From 10th August onward she laid 82 eggs in 82 consecutive days. The weight of her eggs is 24 oz. per dozen and the weight of the hen was 6 lb. 2 oz. at the commencement of the competition and 7 lb. 6 oz. at the finish. According to the rules of the competition this hen was retained at the College for another nine days to complete the full 365 days, and a record for the College competitions was achieved in her laying 337 eggs for the full period, the previous best being 324 eggs.





Two of Mr. J. H. Madrers' Black Orpingtons.

Second prize in Open Heavy Breeds Section (1,511 eggs).

Another hen in the heavy breeds (Standard Section), No. 513, a Langshan, owned by Mr. Townsend has put up the very good tally of 311 eggs. This, however, does not constitute a record for this breed at the College, the highest tally for a Langshan being 319 in the 1920-21 test.

The leading hen (light breeds) laid 302 eggs, but as she is disqualified owing to under-weight eggs, the winner in that section is one of Captain G N. Mann's group, with the very creditable performance of 298 eggs. It will thus be seen that only two eligible hens have exceeded the 300-mark. There are, however, no less than five hens within two eggs of that number. These are owned by Messrs. Mann, McDonald, Wheatley, and Mulliner.

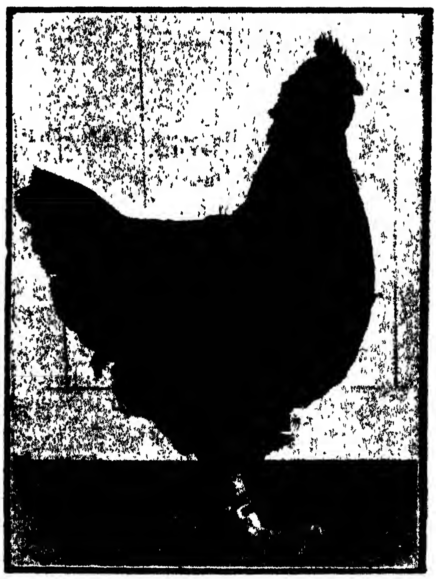
Groups.

In the groups, there are several well up but there are no very conspicuous performances, even the highest tally (1,558 eggs) having been previously exceeded. This was in 1918, when a pen from Messrs. Judson and Son put up a tally of 1,613 eggs, which still stands as a group record for the College tests.

Two of Mr. F. T. Wimole's White Leghorns.
Second prize in Open Light Breeds Section (1,464 eggs).

Mr. P. R. Barsby's leading hen in Standard Light Breeds Section.

This bird laid 280 eggs.

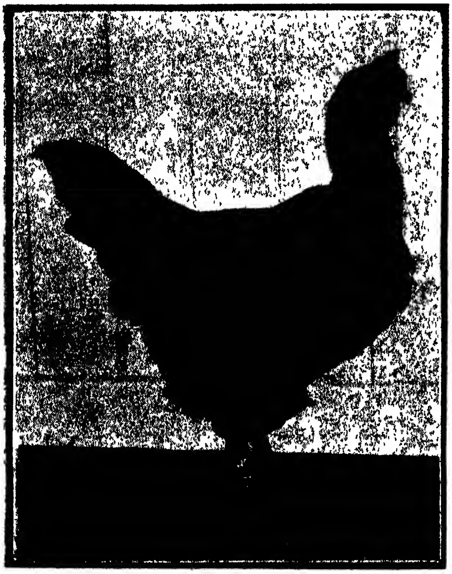


One of Mr. W. M. Mulliner's hens in Standard Heavy Breeds Section.

This bird laid 298 eggs.

The winners in the groups are (heavy breeds) Messrs. Judson and Son with 1,558 eggs, and (light breeds) Mr. Hughes with 1,470 eggs, the latter being followed closely by Messrs. Wimble (1,464 eggs) and Cox (1,456 eggs).

A feature of the last six weeks has been that there was only a margin of sixteen eggs between the six leading pens in the light-breed section. The changing of places in these groups has caused a good deal of interest to those watching for the final result, and not a little embarrassment with regard to securing photographs of the birds likely to win.



Mr. W. Townsend's leading hen in the Standard Heavy Section.

This bird laid 311 eggs.

Summarising the position, it has to be admitted that the weather conditions over the period of this competition have been favourable to egg-production. Nevertheless, a general average of 208·5 is a notable performance. It is encouraging to contemplate that after seven years of more or less retrograde tallies from the high position attained in 1918, the tide has turned towards better averages. It was beginning to be feared that the pinnacle of egg-production in these competitions had been passed.

A circumstance in connection with these competitions which must be taken into account, but which only affects the last two tests, is that the period is nine days less than formerly. It has been claimed that the lost nine days would be more than compensated for by the fact of the incoming pullets being put right into their pens. But since there occurred a mediocre average last year of 204 eggs and a record average in this test of 208·5, further evidence is necessary before claiming a decided advantage in the volume of production attributable to that cause. It is worthy of mention that at the commencement of this test there were fewer rejections on account of underweight, also in respect of type and character, than at the beginning of any test since the enforcement of the weight regulation. This was particularly noticeable in the case of Orpingtons, which were the best lot ever penned in these competitions. The two main sections started well and maintained it right through, finishing up with March production very close to that of February.

Notwithstanding the improvement in the general average, there is still room for improvement in selection of the birds by competitors. From

observations over a large number of flocks every year, I am convinced that fully 30 per cent. of better birds could be selected by competitors from their flocks. Breeders have still much to learn in the art of selection of birds for competition

In connection with the higher average made this year, it will be opined that the tallies made at the Hawkesbury College are still behind some outside of this State, but here again is another factor to be reckoned with: all the tests at Hawkesbury Agricultural College have been carried out on the basis of six pullets, while some other tests are run with two's and three's. The significance of these incidences may not be fully realised by all, but they have a most important bearing on results. One has only to look over the birds as they are penned to see how much better selections could have been made by competitors if two or three pullets were eliminated from the group of six. This is an important factor in final results. I am not here advocating a change in the direction of less numbers, but it is of considerable import when comparing Hawkesbury results with other tests. The Committee controlling the competition has always taken the view that six pullets are a better test of a breeder's status, and the results are much more substantial than a lesser number would be.

Mr. G. H. Mann's leading hen in the Light Breeds Open Section.

This bird laid 298 eggs.

EGG-YIELDS OF EACH BIRD AND GROUP IN THE TWENTY-THIRD ANNUAL COMPETITION.

Owner and Breed.	Totals of Individual Hens.						Totals of Groups.	Weight of Eggs per dozen.	Market Value of Eggs.		
Open Heavy Breeds.											
								oz.	£	s.	d.
C. Judson & Son : Black Orpingtons	248	253	243	213	‖330	277	1,558	26¼	10	14	4
J. H. Madrers : Black Orpingtons ..	240	240	234	266	260	271	1,511	25¼	10	13	10
J. Every : Langshans	293	299	283	246	230	215	1,496	25¾	10	11	1
T. McDonald : Black Orpingtons ..	299	258	227	233	155	260	1,432	26¼	9	14	6
A. R. Sinclair : Langshans	306	236	258	191	282	203	1,376	26¼	9	12	3
A. R. Wheatley : Black Orpingtons..	225	232	242	212	‡159	298	1,368	25¾	9	5	7
A. R. Kennedy : Black Orpingtons..	139	242	248	"233	236	242	1,340	25¼	8	19	4
G. E. Holmes : Black Orpingtons ..	235	254	240	147	226	231	1,333	25½	9	11	11
G. Jobling & Son : Black Orpingtons	148	235	299	249	†139	243	1,313	25	9	4	11
A. George : Black Orpingtons ..	244	167	234	208	224	232	1,309	24½	9	3	5
H. R. Woolf : Langshans	156	†178	248	279	200	211	1,267	26	9	4	0

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EGG-YIELDS OF EACH BIRD AND GROUP IN THE TWENTY-THIRD ANNUAL COMPETITION—*continued.*

Owner and Breed.	Totals of Individual Hens.						Totals of Groups	Weight of Eggs per dozen.	Market Value of Eggs.		
Open Heavy Breeds—continued.								oz.	£	s.	d.
R. B. Kenway: Black Orpingtons ..	211	190	‡289	237	230	101	1,258	24	8	16	5
V. J. Winn: Black Orpingtons ..	172	212	234	215	†154	246	1,233	24½	8	6	1
J. Nicholls: Black Orpingtons ..	164	230	206	191	195	245	1,231	25¾	8	12	8
F. C. Nicholls; Langshans	182	214	172	198	206	243	1,215	25	8	9	8
H. R. Nelson: Black Orpingtons ..	216	211	220	225	154	179	1,205	26	8	2	1
A. E. Ross: Langshans	158	174	249	219	168	245	1,203	25	8	4	0
W. J. Buckland: Black Orpingtons	204	144	222	196	165	204	1,135	26½	8	1	4
J. Farrar: Black Orpingtons ..	221	140	230	143	158	210	1,102	25¾	7	9	5
A. H. Moxey: Black Orpingtons ..	121	171	214	267	80	225	1,078	25¼	7	12	10
J. D. Martin: Plymouth Rocks ..	158	‡179	245	148	124	208	1,062	24	6	17	2
Mrs. C. B. Ferguson: Black Orpingtons.	169	193	146	116	206	211	1,040	26½	6	15	8
E. C. Lunn: Black Orpingtons ..	165	202	195	178	102	164	1,006	27½	6	12	1
Open Light Breeds.											
A. Hughes: White Leghorns ..	†282	219	206	283	260	220	1,470	25	10	6	11
F. T. Wimble: White Leghorns ..	254	256	240	208	266	240	1,464	25½	10	5	6
H. J. Cox: White Leghorns	245	253	266	‡262	216	214	1,456	24	9	18	3
Longworth and Cuthbert: White Leghorns.	261	240	242	250	213	245	1,451	25¾	9	18	8
B. L. Blake: White Leghorns ..	197	270	216	248	235	269	1,435	24¾	9	14	0
H. S. Crear: White Leghorns ..	248	280	193	240	†257	209	1,427	25¾	9	15	4
H. W. Starling: White Leghorns ..	249	222	245	214	230	253	1,422	25¾	9	15	4
B. Clarke: White Leghorns	212	221	242	231	224	270	1,410	24½	9	10	9
F. G. Lombe: White Leghorns .	199	262	219	260	220	244	1,404	26¼	9	12	2
E. H. Shipp: White Leghorns ..	246	235	239	225	234	225	1,404	25½	9	10	7
§D. Sutton: White Leghorns.. ..	231	249	244	†224	256	188	1,392	24¾	9	7	6
H. Cole: White Leghorns ..	214	268	295	209	207	196	1,389	25¼	9	8	4
L. A. Ellis: White Leghorns ..	259	252	240	219	245	165	1,380	26	9	8	5
G. H. Floyd: White Leghorns ..	253	260	220	248	185	210	1,376	25½	9	4	6
Lewis and Stephens: White Leghorns	257	270	140	221	245	233	1,366	25¼	9	0	11
H. W. T. Hambly: White Leghorns	256	†248	262	†144	215	241	1,361	24¾	9	4	6
Anderson Bros.: White Leghorns ..	224	218	265	242	227	*175	1,351	24½	9	8	0
G. N. Mann: White Leghorns ..	*123	217	256	298	234	221	1,349	25	9	3	8
G. Hopping: White Leghorns ..	267	202	211	214	14	230	1,338	25¼	9	3	9
J. Westmacott: White Leghorns	215	186	215	233	248	*239	1,336	25¼	9	4	0
R. Stafford: White Leghorns .	219	216	229	243	190	236	1,333	24¼	8	15	10
H. P. Christie: White Leghorns .	*148	242	252	264	233	*193	1,332	25¾	8	18	6
H. L. Abrook: White Leghorns ..	174	209	210	225	236	271	1,325	25¼	9	1	6
Watson & Stepney: White Leghorns	244	242	192	*194	210	209	1,291	24¾	8	15	6
C. Leach: White Leghorns .. .	217	208	177	226	221	225	1,274	25	8	16	9
J. R. Sellors: White Leghorns ..	231	257	230	151	237	167	1,273	24½	8	18	7
H. E. Hounslow: White Leghorns ..	201	172	242	225	196	232	1,268	24¾	8	9	6
W. H. Hathway; White Leghorns ..	209	193	239	209	221	196	1,267	24¾	8	13	0
D. R. Dove: White Leghorns ..	202	224	222	246	176	192	1,262	24¾	8	15	1
Hilder Bros.: White Leghorns ..	208	216	230	185	190	231	1,260	26¼	8	4	7
F. S. Horner: White Leghorns ..	253	183	235	222	170	197	1,260	25½	8	6	6
O. Buckland: White Leghorns ..	252	261	196	107	188	237	1,241	25¼	8	9	5
M. McInnes: White Leghorns ..	205	246	119	222	236	209	1,237	26¼	8	3	11
H. J. Evans: White Leghorns ..	249	203	257	185	129	211	1,234	26	8	6	4
E. T. Rhodes: White Leghorns ..	256	*202	247	276	†58	195	1,234	26	8	12	9
Lee & Lenney: White Leghorns ..	212	243	205	205	165	202	1,232	25½	8	7	1
M. Mulcahy: White Leghorns ..	190	184	145	249	215	246	1,229	24½	8	16	5
D. Beveridge: White Leghorns ..	181	222	182	203	245	188	1,221	25	8	2	0
R. McLean: White Leghorns ..	253	197	246	0	259	262	1,217	25¼	8	3	9
W. Hunt: White Leghorns .. .	206	169	214	207	232	185	1,213	26	8	5	10
W. H. Summers: White Leghorns..	225	152	175	223	191	244	1,210	25½	8	5	6
D. Asher: White Leghorns ..	218	292	†144	231	*160	*160	1,205	25¾	8	2	1
J. Rayner: White Leghorns ..	224	212	197	205	119	220	1,177	27	7	16	7
F. S. Longley: White Leghorns ..	225	†103	*178	236	204	208	1,154	27	7	13	0
J. C. Smith: White Leghorns ..	184	198	161	198	201	208	1,150	27	7	12	2
W. J. Rutledge: White Leghorns ..	158	195	187	193	181	222	1,136	26½	7	9	0
E. Smith: White Leghorns.. ..	200	*94	226	159	232	211	1,122	26½	7	10	11
H. Battersby: White Leghorns ..	239	188	183	174	228	102	1,114	26¾	7	13	8
A. Greentree: White Leghorns ..	152	173	211	223	†185	164	1,108	25¼	7	17	10
F. Doran: White Leghorns . ..	200	173	213	†93	194	227	1,100	26¾	7	6	11
H. Fernyhough. White Leghorns..	102	252	238	265	†0	242	1,099	25	7	13	6
H. A. Duncan: White Leghorns .	163	197	192	152	183	203	1,090	24½	6	14	3
A. J. Williams: White Leghorns ..	201	168	192	162	157	208	1,088	25½	7	2	6
S. H. K. Champion: White Leghorns	103	190	205	226	195	161	1,080	24¾	6	15	4
C. C. Kennett: White Leghorns ..	*125	175	251	*181	201	144	1,077	26	7	6	6
K. G. Cobcroft: White Leghorns ..	78	‡302	224	206	†157	90	1,057	25	7	1	9
D. Meldrum; White Leghorns ..	†81	†133	258	200	236	†58	961	25	6	14	0

EGG-YIELDS OF EACH BIRD AND GROUP IN THE TWENTY-THIRD ANNUAL COMPETITION—*continued.*

Owner and Breed.	Totals of Individual Hens.						Totals of Groups.	Weight of Eggs per dozen.	Market Value of Eggs.
				Standard Light Breeds.					
P. R. Barsby : White Leghorns ..	199	280	210	213	208	181	1,291	24¾	8 14 5
L. A. Beckett : White Leghorns .	222	176	227	226	251	49	1,151	26	7 11 11
Williamson & Pearce : Buff Leghorns	‡132	183	‡205	178	199	‡†109	‡1,006	23½	6 8 7
A. H. Cliffe : White Leghorns ..	*123	229	202	178	125	123	980	26¼	6 2 10
W. C. Revie : Exchequer Leghorns	‡177	208	147	‡118	105	195	950	24	6 3 7
				Standard Heavy Breeds.					
W. Townsend : Langshans	231	230	311	116	181	239	1,308	25¼	9 11 9
W. M. Mulliner : Black Orpingtons	141	200	201	185	298	226	1,201	26½	8 10 3
P. A. Barrett : Langshans	243	225	222	183	147	152	1,122	25¾	8 7 1
J. Gilbert : Langshans . ..	143	141	258	173	135	221	1,071	25¼	7 11 8
J. Waterhouse : Rhode Island Reds	225	228	214	152	181	†54	1,049	26	7 2 4

* Signifies bird replaced and previous score struck out.
† Signifies bird dead and previous score retained.
‡ Signifies eggs are under the prescribed weight of 24 oz. per dozen and the competing hens are therefore disqualified for prizes.
§ Mr. Sutton's pen competed from 29th April, 1924, only.
‖ Laid 337 eggs for 365 days to 9th April, 1925.

CITRUS PACKING HOUSES.

FOUR years ago the citrus-growers in New South Wales were entirely unorganised. During the coming season (said Mr. H. R. Hallard at a conference of co-operative bodies in Sydney last month) there will be eleven, or possibly twelve, co-operative packing-house companies operating. These vary in size, the largest (at Gosford) being estimated to pack over 100,000 cases, while the smallest will pack probably 10,000 cases, the average pack of the companies being in the vicinity of 30,000 cases.

ISLE OF WIGHT DISEASE.

THE *American Bee Journal,* February issue, says:—Nothing much is heard nowadays concerning the Isle of Wight trouble. Yet it has been working considerable loss in Great Britain. One of our correspondents who spent much time studying the disease and trying to find a remedy writes: "Bee-keeping is still very much under a cloud, owing to I.O.W. disease. I managed to get together thirty colonies during 1921, but in 1923 lost all but one of these. I built up a bit again during the past summer, and so far the colonies I have appear to be healthy. But past experience does not make me very optimistic in regard to the immediate future. Many remedies and preventives are announced, but so far none of them has stood a practical test." As the *Tarsonemus woodi* has been found in France and Switzerland, but has worked little or no havoc there, it would seem that the moist climate of England must have something to do with the virulence of the trouble there.—W. A. GOODACRE, Senior Apiary Instructor.

Pure Seed.

Growers Recommended by the Department.

The Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops, in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon, and (2) after a sample of the seed has been received by the Under Secretary and Director, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the prices for the seeds mentioned hereunder.

Wheat :—	
Canberra	Manager, Experiment Farm, Condobolin
	Hobson Bros., Cunningar.
	J. W. Eade, Eade Vale, Euchareena.
Cleveland	Manager, Experiment Farm, Bathurst.
	W. Burns, "Goongirwarrie," Carcoar
Federation	Hobson Bros., Cunningar.
	Gollasch Bros., Pine Park, Milbrulong.
Firbank	J. W. Eade, Eade Vale, Euchareena.
	Manager, Experiment Farm, Condobolin
Florence	H. Harvey, "Rawsonville," via Dubbo.
Gresley	Manager, Experiment Farm, Condobolin
	Manager, Experiment Farm, Bathurst.
Hard Federation	Hobson Bros., Cunningar.
	J. W. Eade, Eade Vale, Euchareena.
Improved Steinwedel	E. J. Allen, Gregra.
	Hobson Bros., Cunningar.
Marshall's No. 3	Hobson Bros., Cunningar.
	Hannett Bros., Linden Valley, Cunningar.
Wandilla	Hobson Bros., Cunningar.
Waratah...	Hobson Bros., Cunningar.
Yandilla King	Hannett Bros., Linden Valley, Cunningar.
Oats :—	
Algerian	Manager, Experiment Farm, Bathurst.
	Manager, Experiment Farm, Glen Innes.
	Manager, Experiment Farm, Temora.
	Gollasch Bros., Pine Park, Milbrulong.
	F. Rose, junr., "Rosemount," Cunningar.
	E. J. Allen, Gregra.
Guyra	Manager, Experiment Farm. Glen Innes.
Lachlan...	E. J. Allen, Gregra.
	W. V. Herbert "Bongalong," Muttama.
Mulga	C. E. Prell, "Gundowringa," Crookwell
	Manager, Experiment Farm, Temora.
	Gollasch Bros., Pine Park, Milbrulong.
Myall	C. E. Prell, "Gundowringa," Crookwell.
Sunrise	J. W. Eade, Eade Vale, Euchareena.
	C. E. Prell, "Gundowringa," Crookwell.
Yarran	C. E. Prell, "Gundowringa," Crookwell.
Barley :—	
Cape	Manager, Experiment Farm, Bathurst.
Grasses :—	
Phalaris bulbosa	Col. H. F. White, "Baldblair," Guyra.
	Manager, Experiment Farm, Glen Innes.

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

Poultry Notes.

MAY.

JAMES HADLINGTON, Poultry Expert.

AFTER what has appeared in these notes during the past three months relating to the coming breeding season, a simple reminder that mating up the birds should now be completed as soon as possible is all that is necessary on that subject for the time being.

During the past month two events have occurred that are worthy of some comment in relation to the class of poultry kept on commercial farms and to the poultry industry generally. The College Egg-laying Competition has concluded with record performances as to both general average and individual hens. Following upon this there has been brought together at the Royal Agricultural Show the finest display of commercial poultry-farmers' birds yet staged in the Commonwealth, perhaps in the world. This display is the outcome of many years of effort to bring poultry-farmers to a realization of the fact that good stock are not necessarily inferior as a commercial proposition, and that to subscribe to such an hypothesis is to place poultry-farmers on an altogether different plane to that of breeders of other utilitarian animals. The dairy farmer does not despise the fine animals that win in a show, nor does the horse master the steed that takes the blue ribbon, nor yet does the pig breeder the champion boar or sow. Rather do these breeders seek to obtain such blood for the improvement of their farm animals.

This being so, it is a most absurd position that we should find a stigma attached to exhibition poultry. The reason why it has in a measure attached in the past is that many breeds of poultry have become the plaything of the fancier, but the incongruity of the thing is that, as regards the main breeds run for commercial purposes, there is no more warrant in the standards for the exaggerated notions of the fancier than there is for the farmer's neglect of standard requirements. To induce both sections to realise the absurdity of the position has been the aim of a few who have seen matters in their true perspective. Commercial, or so-called utility classes, have been instituted in our shows, and the standard sections in the laying competition have also been means to the same end. This work would appear now to be coming to fruition. Admittedly breeders of standard stock have been slow to take advantage of the standard section in the competition, but this innovation of a few years ago has been followed in one of the main poultry competitions in Great Britain (the Harper Adams College).

The most satisfactory feature in connection with the incoming birds for the test that has now started was the fact that while the standard poultry breeders neglected their opportunity in this section to show what their birds

can do, it was possible to select half a dozen groups from the commercial farmers' entries in the open section to fill their places.

Utility Classes at the R.A.S. Show.

Again, the so-called utility classes at the recent Royal Agricultural Show brought together no fewer than 684 birds, mostly of good quality. Standard quality was an outstanding feature of these exhibits, and many of them left little to be cavilled at in their "get up" for show. The seventy-four breeding teams, comprised of six females and one male to each entry, were an outstanding feature and were rightly accorded pride of place in the poultry pavilion. The success of this innovation has been such as to create quite a flutter in some quarters. Critics are to be found in both camps. The extremist fancier points out that these commercial ideas will kill the shows, while many utility poultry farmers are only too ready to deprecate all notions of quality, fearing that the shows will kill their business.

Between these extremes is to be found the common-sense ideal. If the fancier pursues his tendency towards exaggerations and misinterpretation of the standards in respect of the commercial breeds, the writing is on the wall for him, while at the same time if the utility poultry breeder will not strive to maintain the characteristic of the breed he keeps, the foundation of his business will be undermined.

At a recent discussion of these matters the writer found it necessary to remind both fanciers and commercial men that they had both been losing sight of their common ground in the fact that domestic poultry were utilitarian in origin. It would almost appear that there has been a common agreement between both these sections of breeders—that the nearer birds approach the "off type" and nondescript, the higher their qualifications to be considered good layers. Hence it is that the fancier will dub birds kept for commercial purposes as "rubbish" and beneath his notice, while the poultry-farmer has been accustomed to look upon birds of good quality as a non-paying proposition. "They look nice but will not lay" has been the crystallisation of his outlook. This idea has a serious side to it; it has wrecked scores of farms, lowered the returns from hundreds, and brought many even now to the verge of collapse because of the low standard of type and constitution of their flocks.

There are, however, signs of awakening to a better understanding, and the time is at hand when, while the poultry-farmer will still despise the exaggerations so dear to the heart of the strict fancier, he will be endeavouring to effect improvement in his flocks. Nothing will bring about the consummation of this desirable improvement quicker or more effectively than the conditions which are arising out of the utility farmer measuring his quality with that of standard breeders, nor will anything more quickly break down the barrier between their respective points of view and bring about a more rational attitude on the part of judges towards essential points of the birds.

Amplifying the Standards.

This is already evidenced by the movement on the part of the Poultry Club of New South Wales to amplify the explanatory matter, get rid of some of the ambiguity, and to illustrate the standards of perfection—work upon which a committee is now engaged. The writer would not, if he could, turn every poultry breeder into a show man, nevertheless a little more interest in quality is highly desirable. Not only so, but the work of getting up a few birds for the show pen would have a most educative effect on poultry-keepers. The commercial farmer would gain much experience when handling units which would be of immense benefit to him in his management of flocks.

Again, if those farmers who aspire to supply stud stock had to enter into some sort of competition with regard to quality from a standard point of view, a great benefit would accrue to the poultry industry. As matters stand at present the breeders who can make out the best case for egg-production (no matter how) are those most patronised for stock, irrespective of whether or not the birds supplied are capable of backing up what is claimed for them. So long as this kind of thing holds sway so long will hundreds enter the poultry industry only to meet with disappointment on the score of laying performances. We only raise the productivity of our farms with good stock.

In my lecture at the Royal Agricultural Show it was made clear that the incidence of egg-production had remained almost stationary during the many years of interest in high production. It was shown that going back over a number of years our general average production in laying competitions had not materially increased. Also that the only real advance in averages had followed the enforcement of a better standard of physique as a condition of entrance. It was pointed out that if the average commercial poultry-farmer were asked why the greater prosperity in the industry, he would most likely say that it was due to the fact that whereas the one-time hen laid round about 100 eggs per annum she now laid double that number. This was a great fallacy ; such a theory could not be substantiated even by laying competition figures. In our present state of knowledge we were more or less in the dark as to the transmission of the elusive factor—high productivity—and in the main the industry was still dependent upon the known capabilities of certain breeds in the matter of general average production. It was further pointed out that there was no evidence that the superlaying individuals were due to our skill in breeding, but rather were they a discovery of single penning. Such hens had been in evidence during the whole of my experience in the poultry industry, yet they were not plentiful even now. Nor did they appear to have been instrumental in raising the average production on our farms. It was known that but a comparatively few very high layers produced their like, and, moreover that many poor layers produced progeny of high laying capacity. This meant that selection still remained the greatest factor in respect of high-producing hens.

Orchard Notes.

May.

W. J. ALLEN and W. Le GAY BRERETON.

Even the growers of later fruits, such as tableland apples and pears, and the inland prune and raisin growers, usually have the bulk of their harvesting completed by this month, while the citrus grower generally has only small lots of early oranges, mandarins, or lemons to send forward, so that the early part of May can generally be looked upon as a comparatively slack time for the fruitgrower generally. It is during such breathing spaces he should look down that list of jobs that have been necessarily deferred during periods when packing and despatching fruit have fully occupied his time, or even during the previous pruning and spraying seasons.

Pest Control.

Before closing down the packing shed for the season the deciduous fruit grower should make a final clean-up, so as to destroy, as far as possible, any larvæ or pupæ of codlin moth or other fruit-eating insects harboring about the shed. All cases or other receptacles that have held infected fruit should be dipped in boiling water for three minutes. The larvæ of the codlin moth will work its way between the joints of cases and sufficient time must be given for the boiling water to penetrate. All bags used for packing benches, &c., should be either dipped or burnt.

If the woodwork of the packing benches, &c., cannot be taken down they should be gone over carefully and any open joints or cracks probed with wire, and finally, if possible, the shed made moth-proof for next spring. It may be thought that if the shed is made moth-proof and all infected cases and packing benches are stored within, dipping and searching is unnecessary, but it must not be forgotten that some of the grubs do not emerge as moths at the normal time in the spring, but remain dormant, and emerge at later periods during the season when it is impracticable to keep the packing shed closed. This cleaning up can, of course, wait till any time before the time of normal emergence in the spring, and so can be kept as a wet weather job during the winter, but the danger then is that it is delayed till the next busy season, and finally is neglected altogether.

The bandages should be left on the trees till late in the winter, for quite commonly grubs will shift to them from less secure shelter as the cold and wet increases. Such grubs must be destroyed before the spring.

The importance of this thorough clean-up, both in the shed and in the orchard, can be realised if one remembers that the "carry-over" grub is the sole source of infection in the following season, and that one female moth is capable of laying sixty eggs.

It is generally preferable to complete fumigation at an earlier date, but it will still be effective on red scale.

Woolly Aphis.

Where woolly aphis has got ahead during the busy picking season, the trees can be sprayed with tobacco wash or one of the commercial tobacco extracts as soon as the leaves have thinned out sufficiently. A high pressure should be used and a drenching spray secured by holding the nozzle close to affected parts to break up the clusters of the insects. The spray gun or pistol are good for this work, if sufficient pressure is maintained.

If the aphis is thick and the trees large this requires a quantity of spray, much of which collects about the butt of the tree, and for this reason it is preferable to use a harmless spray, such as tobacco wash or one of the commercial extracts, rather than an oil.

Most encouraging reports of the results of the parasite *Aphelinus mali* on woolly aphis continue to come to hand from Queensland and New Zealand. The Entomologist to the Department has bred out several generations of this parasitic insect supplied from New Zealand, and is consequently now able to supply apple growers without the slightest danger of the dread disease fire blight being introduced.

Pruning.

By starting pruning this month on stone fruit trees that have become dormant a longer season is obtained, and often economy of labour can be effected in this way. Moreover, in some districts May is often dry, whereas much bad weather occurs in the later winter months which hampers this work.

It is sometimes claimed that trees pruned early are more likely to break into bloom if a spell of abnormally warm weather follows. However, departmental experiments have failed conclusively to decide this point. A leaflet on pruning can be obtained from the department, free of charge, and a book dealing more fully with the subject may be purchased for 3s. 3d., post free.

Wax Moths and Foul Brood.

The *Bee World*, an English publication, gives the following in its December issue:—Mr. M. F. Vincens communicated a paper to the Paris Academy of Sciences on the above subject. His researches at the Cagneo Agricultural Research Station have shown that it is probable that wax-moth larvæ can carry American foul-brood infection. The spores of *Bacillus larvæ* were found in large quantities in the excreta of wax-moth larvæ fed on "foul-broody" combs. The larvæ were not themselves attacked by the disease; even where M. Vincens inoculated spores into their body-cavity, only a few died. If the larvæ of the *Galleria mellonella* spent all their lives in one hive, they could only spread the disease if it passed into their systems, and thence into the eggs laid by the moths later. But M. Vincens has observed that the larvæ will leave a box of combs in which they are living, and will travel (by night) to neighbouring hives. Both old and young larvæ took part in these migrations. It is, therefore, possible that they may assist in spreading foul-brood.—W. A. Goodacre, Senior Apiary Instructor.

AGRICULTURAL SOCIETIES' SHOWS.

Secretaries are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alterations of dates should be notified at once.

1925.

Society.	Secretary.	Date.
Kyogle P. A. and H. Society	D. Campbell	May 20, 21
Trangie P. A. and H. Association	A. K. Butter	" 26, 27
Bonalbo P. and A. Society	....	June 3, 4
Warren P. and A. Association	A. C. Tompson	" 3, 4
Nyngan P. and A. Association	....	" 9, 10
Wentworth P. A. and H. Society	W. B. Crang	July 15, 16
Peak Hill P. and A. Association	T. Jackson	" 21, 22
Tullamore P. and A. Association	....	" 28, 29
Condobolin P. and A. Association	J. Carter	Aug. 4, 5
Bogan Gate P. and A. Association	J. Egan	" 11
Trundle P. and A. Association	W. A. Tolmie	" 13, 14
Parkes P. A. H. and I. Association	L. S. Seaborn	" 18, 19
Forbes P. A. H. and I. Association	E. A. Austen	" 25, 26
Murrumbidgee P. and A. Association (Wagga)	F. H. Croaker	" 25, 26, 27
Grenfell P. A. and H. Association	G. Cousins	Sept. 1, 2
Cootamundra A. P. H. and I. Association	W. W. Brunton	" 1, 2
Manildra P. and A. Association	J. Longley	" 8, 9
Culcairn P. A. H. and I. Society	J. N. Douglas	" 8, 9
Young P. and A. Association	T. A. Tester	" 8, 9, 10
Cowra P. A. and H. Association	E. D. Todhunter	" 15, 16
Ganmain A. and P. Association	A. R. Thuedle	" 15, 16
Holbrook P. and A. Society	J. S. Stewart	" 15, 16
Junee P. A. and I. Association	G. W. Scrivener	" 15, 16
West Wyalong P. A. H. and I. Association	T. A. Smith	" 15, 16, 17
Northern A. Association (Singleton)	S. Griffits	" 16, 17, 18
Temora P. A. H. and I. Association	A. D. Ness	" 22, 23, 24
Canowindra P. A. and H. Association	J. T. Rue	" 22, 23
Lockhart A. and P. Society	E. D. Arnold	" 22, 23
Murrumburrah P. A. and I. Association	W. Worner	" 29, 30
Barellan P. A. and I. Society	H. H. Cuthbert	" 30
Barmedman A. and H. Society	T. P. Meagher	" 30
Corowa P. A. and H. Society	J. D. Fraser	Oct. 2, 3
Burrowa P. A. and H. Association	W. Burns	" 6, 7
Ardlethan A. Society	R. L. Neill	" 7
Hay P. and A. Association	C. L. Lincolne	" 7, 8
Narrandera P. and A. Association	W. H. Canton	" 13, 14
Griffith A. Society	M. E. Sellin	" 13, 14
Ariah Park A. Society	J. F. McInnes	" 14
Deniliquin P. and A. Society	P. Fagan	" 21
Lismore A. and I. Society	H. Pritchard	Nov. 17, 18, 19

1926

Society.	Secretary.	Date.
Newcastle A. H. and I. Association	E. J. Dann	Feb. 23 to 27
Yass P. and A. Association	E. A. Hickey	Mar. 10, 11
Campbelltown A. Society	W. N. Rudd	" 12, 13

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Agricultural Gazette of New South Wales.

Fallow and Crop Competitions.

REPORTS OF JUDGES.

West Wyalong and District.

E. S. CLAYTON, H.D.A., Agricultural Instructor.

EIGHT entries were received, which must be considered very satisfactory, as the competitions were only inaugurated this year.

Two separate competitions were held, viz., (1) 50 acres of fallow, to be judged on the following scale of points:—Moisture 10, mulch 20, freedom from weeds 20, consolidation 25, cultivation 25; total, 100. (2) 100 acres combined fallow and crop competition, the fallow to be judged on the following scale of points:—Moisture 30, mulch 30, freedom from weeds 30, consolidation 30, cultivation 30; total, 150.

Judging commenced on 16th March, and as very little rain had fallen during the previous six weeks the effectiveness or otherwise of the mulch was strikingly reflected in the amount of moisture present in the soil.

As this is the first fallowing competition held in this district, it may be advisable to discuss the essential points of fallowing. The object is to store as much moisture as possible in the soil and subsoil, to germinate and destroy weeds and to consolidate the sub-surface soil.

The first essential is early ploughing. By delaying the ploughing less moisture is stored in the soil and the subsequent wheat yield is reduced. Summer fallowing is a practice which recommends itself. This means that the land is ploughed in February or March, instead of June and July, thus giving a fallow of fourteen or fifteen months instead of the usual ten or eleven months.

After ploughing, the land may be harrowed if desired to break down the comb. At the end of the winter or early spring the fallow should be cultivated to the full ploughing depth with a springtooth cultivator (or similar implement) with fine points, in order to bring the clods to the surface and allow the finer particles to fall to the bottom, so that a complete union may take place between the ploughed soil and that below the ploughing depth. If clods are left at the bottom of the ploughed land air spaces occur and the sub-surface cannot be consolidated. This consolidation is necessary before moisture can rise freely from the lower levels of the soil by capillary attraction against the downward pull of gravity. It is essential that this consolidated soil be within 2 or 3 inches of the surface, so that when the wheat is sown the small roots of the young wheat plants may strike immediately into the firm soil where the moisture has risen to instead of having to penetrate through loosely-packed soil.

No hard and fast rules can be laid down as to when and how to work fallowed land, but as a general rule it should be worked soon after every very heavy fall of rain during the summer and autumn. After the first deep cultivation to bring up the clods, the subsequent workings should be shallow (about 2½ inches) so as not to disturb the subsurface soil. Many a fallow is spoiled by a deep cultivation in the autumn.

One good feature of the competition was the cleanliness of all the fallows entered. This is very creditable in view of the heavy summer rain received this season. Unfortunately, disc cultivators had to be used on some of the fallows in order to handle the weed growth. This is to be expected in such a season, but wherever possible the weeds should be kept in check by the use of tine implements aided by sheep. By working the fallows with wide points on the cultivator while the weeds are small it is often possible to prevent the land getting into such a weedy condition as to necessitate the use of the disc. On those fallows on which a disc was used the mulch was rendered less effective and more liable to run together and set hard after rain. Also, the consolidation was interfered with in most cases by the implement going too deep in the endeavour to destroy the weeds.

The fallows entered by Messrs. D. and J. Gagie and H. W. Staniforth were particularly pleasing. These competitors are familiar with the finer points of fallowing, and their fallows were outstanding as regards consolidation.

The winning fallow was mouldboard-ploughed 4 inches deep in June and early July, and cultivated in September to the full ploughing depth with a springtooth cultivator with fine points. It was then springtoothed twice in October to a depth of about 2½ inches, again cultivated shallow in January and again in February. Wide points were used on the cultivator to destroy weeds. Sheep were grazed on the fallow.

Mr. Staniforth's fallow was mouldboard-ploughed in July about 4 inches deep. It was cultivated in August with a springtooth cultivator to the full ploughing depth, then harrowed, and springtoothed in October, again in January and in February. These later cultivations were all shallow. Portion of the 100-acre fallow, however, had to be disced in February in order to destroy weeds (chiefly paddymelons). This unfortunately made the mulch a little too deep and rendered it too fine on top. Although Mr. Staniforth was loth to use the disc, he was forced to do so on portion of the area, as the weed growth was becoming too vigorous to be dealt with in any other way. Sheep were grazed on the fallow.

Clean fallowing without the use of the disc was extremely difficult this season on account of the heavy summer rains. That it was possible, however, was demonstrated by Messrs. D. and J. Gagie's fallow, and by Mr. Staniforth's 50-acre fallow. Too many farmers, however, delay working their fallows while the weeds are young; consequently a disc must subsequently be used to clean the land. In normal years a fallow should never be allowed to get into such a condition as to demand the use of a disc implement.

Sheep were used on all the fallows inspected, and the rainfall on the fallows varied from 17 inches to 22 inches.

DETAILS of Awards.

—	Moisture.	Mulch.	Freedom from Weeds.	Consolidation.	Cultivation.	Total.
50-acre Fallow Competition.						
D. and J. Gagie, West Wyalong ...	7	19	17	23	24	90
H. W. Staniforth, Buddigower	8	18	17	22	23	88
S. E. Ford, Wyalong	9	18	19	18	22	86
A. Leslie, Tallimba	5	14	19	20	22	80
J. Moncrieff, Wyalong	5	6	18	22	18	69
J. Jones, Mildil	7	16	19	7	19	68
B. Davies, West Wyalong	7	15	19	7	18	66
D. B. Andrews, West Wyalong ...	8	17	17	6	14	62
100-acre Fallow and Crop Competition.						
D. and J. Gagie, West Wyalong	24	28	26	28	28	134
H. W. Staniforth, Buddigower... ...	26	27	25	27	25	130
S. E. Ford, Wyalong	27	24	28	22	26	127
A. Leslie, Tallimba ...	17	20	28	23	24	112
B. Davies, West Wyalong	20	22	28	6	20	96
J. Jones, Mildil	15	20	29	8	20	92

Corowa Competition.

E. S. CLAYTON, H.D.A., Agricultural Instructor.

It is pleasing to note that there is a general improvement in the fallows entered. In spite of the heavy rain experienced this summer most of the fallows presented a clean appearance. Many are also much better as regards consolidation.

The winning fallow was entered by Mr. W. Johnston. Portion of the area had been ploughed 4 inches deep with a mouldboard plough the first week in April, and the remainder had been one way disced on the same date. The whole area was scarified to the full ploughing depth at the end of May, scarified again 2½ inches deep in September, again in October, January and March. Sheep were grazed on the fallow and 25 inches of rain were recorded. The land was free from weeds and well supplied with moisture; the mulch was just a little too deep and also a little too fine on top; the consolidation was very fair.

The fallow entered by Messrs. F. W. Knight and Sons had been mouldboard-ploughed 4½ inches deep in September, harrowed and springtoothed in November, springtoothed twice in January, and skim-ploughed in March. It was free from weeds and well supplied with moisture, the consolidation was very fair, the mulch was a little too fine (due to the use of the skim plough), also a little too deep.

The fallows were inspected at a very opportune time, as the previous month had been dry, and the effectiveness or otherwise of the mulches was reflected in the amount of moisture present in the soil. Most of the fallows

were well supplied with moisture, but a few, on which the mulch had been beaten down by rain and so rendered ineffective, had lost quite a lot of stored moisture by evaporation.

Sheep had been grazed on all the fallows entered, and the district again maintained its reputation for clean fallows in spite of the heavy summer rains received this year. There is one important factor to which insufficient attention is paid, and that is the time of ploughing. The majority of the fallows were ploughed in August and September, only four were ploughed in July, and only one summer fallow was entered. Any delay in the time of ploughing undoubtedly reduces the ultimate wheat yield, therefore every effort should be made to complete the ploughing in June or July. Some farmers are going a step further, and are summer fallowing a portion of their land. By summer fallowing is meant ploughing and cultivating in February or March and so giving a much longer fallow. The slight loss of the stubble for grazing is made up for by the early germination of the weeds (including black oats) on the cultivated land. This method is invaluable in cleaning up land badly infested with black oats

DETAILS of AWARDS.

	Moisture.	Mulch.	Freedom from Weeds.	Consolidation.	Cultivation.	Total.
Maximum Points.	30	30	30	30	30	150
W. Johnston	26	22	29	24	24	125
F. W. Knight and Sons	26	25	29	22	22	124
T. Gilchrist	23	26	29	23	22	123
W. Davis	25	21	27	23	25	121
J. McKendrick	24	20	26	27	23	120
A. Dickens	26	27	27	18	22	120
J. J. Knight, junior	25	27	28	18	20	118
E. Davis	24	25	28	18	22	117

Western District—Parkes and Forbes.

H. BARTLETT, H.D.A., Senior Agricultural Instructor.

Parkes and Forbes P.A. and H. Association are again to the fore in the matter of field competitions in the wheat areas, and although entries were not numerous in the fallow competitions recently judged, the average quality of the fallows submitted for inspection showed a marked improvement over those of two years ago.

The result of the Parkes competition holds greater interest than in previous years, as the association is giving, in addition to the usual trophies

for the crop competition of 1925, additional trophies for the combined results of the fallow competition of 1924-25, and the crop grown on that fallow in 1925.

RAINFALL Records.

	Parkes Post Office.	H. K. Nock, Nelungaloo.	E. J. Johnson, Wongalea.	W. W. Watson, Tichborne.	N. G. McMillan, Forbes.
1924.	Points.	Points	Points.	Points.	Points.
June	243	145	..	222	...
July...	229	251	221	211	...
August	193	169	178	210	...
September	426	289	372	308	...
October	133	64	150	153	79
November	446	617	365	656	591
December	170	236	192	242	197
1925.					
January	442	204	319	189	260
February	557	346	300	165	223
March	97	119	73	92	173
	29·36	24·40	*	24·48	*

* Incomplete.

The Parkes Competition.

First place was awarded to a fallow exhibited by Mr. H. E. Ward, of Gwenvale, Parkes. Such a result is particularly pleasing, as this was Mr. Ward's initial attempt to carry off the honours of a field competition. It also relieves the impression that a novice has little chance of success against the "old hands." The genuine manner in which those "old hands" congratulated the winner after inspecting his fallow no doubt added to the pleasure of his success.

Mr. Ward's block may be termed a silty loam, generally greyish in colour, flashed with brown, 1 foot in depth, then merging into a clayey subsoil. The previous crop was wheat in 1923, the stubble being grazed and portions then burnt. The land was mouldboard-ploughed in June, 1924, 4 inches in depth; harrowed in July; cultivated with a combine twice in October to kill oat seedlings; disc-cultivated in January to destroy weeds and break a somewhat set surface; springtooth-cultivated in February; harrowed in March. Altogether the land was worked six times after ploughing, the result being almost a faultless fallow. Sheep aided considerably in keeping down weed growth.

Mr. J. Aitken, of Harrowvale, Parkes, secured second place with a block on deep red loam country, the soil of which is particularly uniform to a depth of several feet. The previous crop was wheaten hay in 1923. The ground was mouldboard-ploughed 4 inches deep in July, 1924, and then not worked till February, 1925, when it was springtoothed twice. Some 1,700 sheep had the run of 300 acres of fallow, 130 acres of barley and oat stubble, and 40 acres of grass from October, 1924, to February, 1925.

Mr. J. R. Postlethwaite's block was placed third, the soil being chocolate to red clayey loam, generally typical of myall country. The previous crop was wheat in 1923, the stubble of which was grazed. The ground was mouldboard-ploughed in July 4 inches deep, and scarified with a stump-jump scarifier in September, 1924; again in October, January, 1925, and March, 1925. Sheep were used to keep down weed growth.

DETAILS of Awards for Parkes Competition.

	Moisture.	Mulch.	Freedom from Weeds.	Consolidation.	Cultivation.	Total.
Maximum points	30	30	30	30	30	150
H. E. Ward	27	27	27	26	29	136
J. Aitken	26	27	27	27	27	134
J. R. Postlethwaite	29	24	28	27	25	133
W. W. Watson	23	24	28	26	28	129
R. M. Kelly	27	23	27	25	26	128
R. Scrivener	27	20	25	27	26	125
H. K. Nock	23	20	28	23	23	117
E. J. Johnson	22	24	20	26	21	113
G. Mill	21	23	22	22	23	111
R. Job	20	18	26	19	25	108
H. S. Cousins	20	17	22	20	23	102

The Forbes Competition.

Mr. D. L. N. M ller, of "Glenlossie," Daroolbalgie, registers his second win in Forbes fallow competitions, having secured the honour in 1923. The soil is a chocolate to brown loam to clayey loam, 5 inches in depth, overlying a retentive subsoil. The paddock was cropped to wheat in 1923; stubble grazed, and a fairly large amount of green stuff was ploughed under with a mouldboard plough 4 inches deep in May-June, 1924; disc-cultivated August, and again in October; springtooth-cultivated January, 1925; disc-cultivated February-March; harrowed 1st April; 700 sheep were frequently on the fallow of 100 acres. The fallow was worked five times after ploughing.

Mr. W. W. Watson, of "Woodbine," Tichborne, competed in the Forbes as well as the Parkes competition, the blocks being in separate paddocks. The soil is of a silty sandy loam nature, which had been cropped to oats in 1923, the stubble being grazed. The ground was mouldboard-ploughed 4 inches deep July; springtooth-cultivated in September, again in February, 1925, and again in March. Sheep were frequently grazed on the fallow.

Mr. W. R. Gunning, of Clothilde, Daroolbalgie, gained third place with a fallow exhibited on country very similar to that of Mr. Miller. The paddock had grown wheat in 1923, the stubble of which was grazed. It was summer cultivated with the disc cultivator in March, 1924, which proved very successful in germinating black oat seeds prior to the ploughing of the fallow.

Portion was disc- and portion mouldboard-ploughed 4 nches deep in July, springtooth-cultivated in September, and again at the end of January, 1925. Sheep were frequently grazed on the fallow.

DETAILS of Awards for Forbes Competition.

	Moisture.	Mulch.	Freedom from Weeds	Consolidation.	Cultivation.	Total.
Maximum points ...	30	30	30	30	30	150
D. L. W. Miller ...	27	26	30	28	26	137
W. W. Watson ...	24	24	27	26	27	128
W. R. Gunning ...	25	20	27	27	25	124
N. G. McMillan ...	19	20	29	22	22	112
R. J. Elliott ...	24	20	28	15	22	109

Principles of Fallowing.

Although the principles underlying the production of a high-class fallow have previously been discussed, it seems that they will bear repetition, especially as certain indefinite factors are likely to be overlooked in the striving after more prominent and visible objectives. Moisture conservation by the aid of a suitable mulch, and consolidation of the subsurface soil are of paramount importance, but we must respect the claims to prominence of the ease of penetration of the rainfall to the subsoil, the liberation of material for plant-food by the aid of aeration and warmth during the spring months, the setting of the surface soil if reduced to a fine tilth, and the loss of water and fine soil occasioned by surface run-off during heavy summer rains.

The following may be presented as a general guide for the practice of fallowing:—If the previous crop was "dirty," either with weeds (oats) or disease, burn the stubble early, and cultivate in February or March. Usually a good germination of the rubbish seeds will follow in May; graze this growth, but leave a good covering to plough under in June-July to augment the humus supply. In September springtooth-cultivate to the depth of the ploughing, and again in October to a depth of 2½ inches to form a mulch. After harvest, cultivate to maintain a mulch and to secure consolidation of the subsurface soil.

While the land is lying in a loose, open condition, as left by the plough, moisture can penetrate easily into the subsoil, aeration is secured to the ploughing depth, and the temperature is higher than in fine compact soil. This means that the conditions are most favourable to the growth of the useful soil bacteria, and to the oxidation of the minerals necessary for the growth of plants. Such a condition of the surface soil during the summer months, however, would sadly deplete the soil of moisture and humus, so it is to our advantage to prolong the former conditions only until such time as the latter conditions begin. The "springtoothing" in September brings clods to the surface, thus eliminating air pockets, and that in October creates a mulch for the conservation of moisture over the harvest period.

Up to this point our concern has been—

(1) To clear the land of weed and disease seeds.
(2) To add vegetable matter to the soil.
(3) To aid the penetration of water to the subsoil.
(4) To increase the available plant-food.
(5) To make the initial preparation of the mulch and seed-bed.

Now begins the work which will make or mar our crop. We must lock in the soil that which we have secured and manufactured—moisture and soluble material for plant-food. We must secure a level face of a consolidated subsurface soil, which will enable the seed to be sown on moist firm soil at a uniform correct depth over the whole of the fallow, which is conducive to a uniform and quick germination. Two or three cultivations after harvest and prior to sowing, aided by the summer rains, will generally be sufficient to put the fallow in the required condition.

Though consolidation is essential, exaggeration should be avoided. Compact the subsurface strata of 2 inches of sweetened soil sufficiently to induce the free rise of the subsoil moisture, and at the same time leave it open enough for the easy penetration of the roots of the seedlings.

Varying Conditions and Readustment of Routine.

Nobody with a knowledge of the western district would advocate a hard and fast system for working a fallow, and yet conditions for wheat growing are uniform enough to adopt a general plan, with modification to suit seasonal conditions.

Referring to the general guide already discussed, it may be argued that if we depend upon conditions from January till April to consolidate the fallow, the fallow will suffer in periods of drought through lack of consolidation; but it is equally true that if fallows are closed by December, with the consequent rather fine mulch brought about by frequent workings, summer storms have little chance of being caught and held in the soil, surface run-off is excessive, and with it the loss of some of the finest and richest portions of the soil. The caking or setting of the mulch is very marked under these circumstances, and there is a danger of the consolidation becoming too compact and hard.

A mulch of 2½ or 2 inches is desirable; less will not effectively prevent evaporation, and more will necessitate the seed being sown in loose soil.

Owing to the growth of weeds, particularly wild melons, the disc cultivator has often to be used, and as this implement will not work effectively at a shallower depth than 3 inches, and as it also reduces the mulch to a fine condition, mixing fine soil and clods to the depth of working, the condition of the mulch and consolidation is frequently injured. Such a working during March depreciated the value of several fallows recently judged.

Value of Green Manure.

There is no doubt that some of our wheat lands, more particularly the lighter soil types, are showing the effect of the simple rotation—wheat and fallow—inasmuch as the humus or vegetable matter in the soil is lessening,

indicated by the lack of mellowness, and by caking of the soil. This has generally been considered a debatable point, and recommendations to supply humus have been tolerated, though not accepted, by those most interested. South Australian farmers were warned twenty years ago of what would happen under the simple rotation, and I have it on good authority that the harmful effects are now beginning to be felt.

To maintain our lands in good physical condition under the system of fallowing, something more than the roots of the stubbles seems to be necessary to keep up the supply of humus. Stubble land, eaten bare of all green growth, makes easy ploughing, but low fertility. Do not put all the green growth through the sheep; make them share it with the land, provided the fallows are ploughed early. If a fair amount of green stuff is ploughed in, it may be necessary to harrow immediately after the ploughing, thus partly closing the soil to aid decomposition, which should be almost complete within three months. In this case a readjustment in the method of working the fallow is necessary.

Sheep on Fallows.

The value of sheep in the economical production of good fallow is fairly well recognised, but the most forcible illustration of such value came under my notice when judging Mr. J. Aitken's fallow, which was placed second in the Parkes competition. A reference to the working of this fallow conveys the impression that the workings advocated in this report are laborious and wasteful of time and energy. But let the reader study the climatic conditions during the months December to February, which were remarkable for exceptionally heavy rains and mild temperatures, and he will find that a loose open condition of the soil until the month of February was an advantage on this occasion. Sheep kept down the weed-growth, surface run-off was reduced to a minimum, caking was greatly reduced by the roughness of the surface, and the tramping of the sheep (aided by the exceptional rains) was sufficient to bring about the desired consolidation. Some moisture was certainly lost by evaporation, owing to the partial caking of the surface prior to the February cultivations, but the loss was replaced by subsequent rains. Mr. Aitken produced such a fallow by a combination of luck and good management. Had the summer been normal, the fallow would not have been worthy of the name, a fact that was recognised by Mr. Aitken, who, under those conditions, would certainly not have neglected to work the fallow. Reference is made to this fallow because it so forcibly illustrates the value of sheep in this kind of work, even though it is strongly urged that farmers should not rely upon sheep to the extent which occurred in this case.

Conclusion.

By reference to the award tables, and a perusal of the main factors discussed in this paper, competitors may be able to determine where their fallows were lacking, and how best to improve them in subsequent years.

Let the advice be given:—Study your soil; study the climate; and study your neighbour's farming methods.

The Value of Fallowing.

THE advantages of fallowing as a method of cultivation were once more conspicuous in the wheat harvest for the season 1924-25. Individual examples of better crops as a result of its adoption were numerous, but an important indication of its vast total value to New South Wales is afforded in the final harvest returns, which have been compiled by the Government Statistician. The average production of grain from fallowed land throughout the State was actually 4·9 bushels per acre greater than from new land or stubble—a truly remarkable result. The significance of the Statistician's figures is even greater than that, for in the Western Slopes and Riverina districts—where the area cropped is greatest, and where any excess in production therefore is of greatest moment—the increase from fallowed land varied between 4 bushels and 6·2 bushels per acre over other classes of cultivation.

On this aspect of the 1924-25 harvest, the Government Statistician has been good enough to supply us with the following figures not published elsewhere:—

RESULTS of Wheat Harvest, 1924–25.

District.	Area Harvested for Grain.			Average Production.		
	On New Land.	On Fallowed Land.	On Stubble.	On New Land.	On Fallow.	On Stubble.
	acres.	acres.	acres.	bush.	bush.	bush.
North Coast	...	...	...	...	...	...
Hunter and Manning	780	352	2,091	9·8	12·8	10·7
County Cumberland	...	...	...	...	...	...
South Coast	...	...	38	...	..	22·3
Total, Coastal	780	352	2,129	9·8	12·8	10·9
Northern Tableland	28	11	3,594	25·7	30.0	23·1
Central Tableland	2,377	51,846	106,526	15·1	21·2	16·5
Southern Tableland	163	4,765	4,526	18·6	19·1	16·1
Total, Tablelands ...	2,568	56,622	114,646	15·4	21·1	16·7
North-western Slopes	7,861	21,792	303,287	15·1	19·3	16·4
Central-western Slopes ...	38,998	224,676	611,453	16·1	19·1	14·6
South-western Slopes	29,161	541,267	264,180	15·2	19·8	13·9
Total, Western Slopes ...	76,020	787,735	1,178,920	15·6	19·6	14·9
North Central Plains	6,779	11,599	117,529	12·7	19·6	15·3
Central Plains	20,680	45,208	92,811	11·2	17·8	13·6
Riverina	42,102	680,703	271,472	15·6	20·0	13·8
Total, Central Plains and Riverina	69,561	737,510	481,812	14·0	19·8	14·2
East of Darling	965	828	2,557	2·4	9·5	4·3
West of Darling	...	...	5	...	...	3·0
Total, Western Division	965	828	2,562	2·4	9·5	4·3
Grand Total, New South Wales...	149,894	1,583,047	1,780,069	14·8	19·7	14·8

Experiments with Cereal Crops.
Temora Experiment Farm, 1924.

H. C. STENING, H.D.A., Manager.

Some seven experiments with cereals were conducted at Temora Experiment Farm during the 1924 season, namely, variety trials with wheat (hay and grain) and oats, fertiliser, rate of seeding and cultivation trials, and a test of bunt preventives.

Wheat (Grain) Variety Trial.

Sowing took place on 8th to 15th May, at the rate of 45 lb. seed with 70 lb. superphosphate per acre. Most of the early-maturing varieties lodged in patches, the varieties to suffer most being Early Bird, Firbank, Canberra, Aussie, and Clarendon. The yields were as follows :—

Variety.	Yield per acre. bus.	lb.	Variety.	Yield per acre. bus.	lb.
Waratah	43	26	Currawa	31	9
Indian F x Federation	40	0	Improved Steinwedel..	31	0
Wandilla	39	43	Penny	30	0
Union	39	37	Caliph	30	0
Canimbla	39	32	Federation	29	37
Yandilla King ...	37	30	President	29	27
Cadia	37	21	King's White... ..	29	23
Indian F x Telford ..	36	55	Bald Knob	29	10
Marshall's No 3 ...	36	51	Rajah	28	52
Bomen	36	31	Bald Early	28	15
Ghurka x Bomen ...	36	24	Emperor	28	0
Bena	36	4	Maharajah	27	42
Queen Fan	36	0	Canberra	26	51
Quartzy	35	42	Aussie	26	34
Gresley	33	33	Onas	26	13
Major	33	12	Riverina	25	18
College Purple ...	32	51	Clarendon	24	0
Hard Federation ...	32	7	Early Bird	22	37
Sultan	32	6	Firbank	20	24
Felix	31	47			

Fertiliser Trial.

Sown 8th May with Federation wheat at the rate of 50 lb. seed per acre. The yields obtained from the different applications of superphosphate were as follows :—

Superphosphate per acre.	Yield per acre. bus.	lb.
56 lb.	29	0
70 lb.	29	37
84 lb.	29	40
98 lb.	29	47

Rate of Seeding Trial.

Sown 8th May with Federation wheat, manured with 70 lb. superphosphate per acre, with the following results :—

Seed per acre.	Yield per acre. bus.	lb.
45 lb.	29	9
55 lb.	29	31
65 lb.	29	38
75 lb.	29	35

Test of Bunt Preventives.

Sown 26th May with Federation wheat at the rate of 60 lb. seed with 70 lb. superphosphate per acre. This test was conducted solely for the purpose of testing the effect of the fungicides on the germination and yield. Soil conditions were ideal for germination, and no difference could be observed in the germination of the three plots. The yields were as follows :—

Fungicide.	Yield per acre. bus.	lb.
Dry copper carbonate	23	2
¼ per cent. formalin solution	22	48
1 per cent. bluestone solution	21	56

Cultivation Experiment.

Sown 16th to 18th May with Federation wheat, at the rate of 60 lb. seed, with 70 lb. superphosphate per acre.

Cultivation.	Yield per acre. bus.	lb.
Cultivated autumn, ploughed July ...	27	55
Ploughed autumn, cultivated July ...	27	0
No autumn cultivation, ploughed July..	26	25
Cultivated autumn, cultivated July ...	25	48

The autumn cultivation was performed with a springtooth cultivator. Apart from the above cultivations, all plots received similar treatment as follows: Harrowed September, springtoothed October, disced early December, springtoothed early April, springtoothed and harrowed before sowing.

Wheat (Hay) Variety Trial.

Sown 2nd to 7th May, at the rate of 70 lb. seed, with 70 lb superphosphate per acre.

Variety.	Yield per acre. tons.	cwt.
Sultan	3	5
Gresley	3	0
King's White	3	0
Felix	2	15
Maharajah	2	15
Emperor	2	8
Rajah	2	7
President	2	5

Oat Variety Trial.

Sown 1st and 2nd May, at the rate of 45 to 50 lb. seed, with 56 lb. superphosphate per acre. The Mulga and Quandong plots lodged badly, and decrease of yield was also occasioned by shedding. The other varieties also suffered loss owing to lodging in patches. The yields were as follows :—

Variety.	Yield per acre. bus.	lb.
Lachlan	57	20
Algerian x Red Rust-proof	55	10
Guyra	54	25
Algerian	52	35
Belar	48	16
Sunrise	47	20
Myall	41	34
Mulga	32	5
Quandong	27	0

Farmers' Experiment Plots.

Wheat and Oat Experiments, 1924.

Western District (Parkes Centre).

H. BARTLETT, H.D.A., Senior Agricultural Instructor.

The subdivision of the western district a few years ago into two areas, and the establishment of an agricultural instructor in the centre of each area, has made possible a considerable extension of experimental and demonstrational work.

The object of experimental work is to determine the value of unproved systems, suggestions, treatments, and varieties, and the object of demonstrational work is to make known those factors which are proved to be of value in increasing crop returns. After a careful inspection and study of the western wheat-growing district it was felt that the greatest amount of good work would be accomplished by endeavouring to increase the average yield, rather than by increasing the maximum yield—in other words, by giving publicity to proven factors, rather than concentrating on purely experimental work with only the most successful farmers. It was therefore essential to secure the interest and co-operation of a large number of farmers, giving each a personal interest in the work.

It was very apparent that improvement could quickly be brought about in several directions: (1) By the introduction of pure seed wheat; (2) by the elimination of the lower-yielding varieties; (3) by the general adoption of manuring and by increasing the amount usually applied (30-40 lb.); (4) by popularising the oat crop and introducing pure seed; (5) by slightly increasing the amount of wheat seed sown per acre; (6) by the use of the dry treatment of wheat seed in place of the wet treatment; (7) by more efficient working of fallows.

The means adopted to gain the ear and interest of the farmers were a combination of demonstrational and experimental plots—75 per cent. of the former, and 25 per cent. of the latter. A series of "experiments" were planned, conforming to the objectives in view, and one or more of such areas were placed with each of sixty-two farmers. To effectively carry on this work outside assistance was necessary, and the success of the work has been due to the keen co-operation of the local branches of the Agricultural Bureau

This portion of the western district is fortunate in having nine branches of the Agricultural Bureau, each one of which is co-operating in this work, each having formed a sub-committee to control and allot experiments under the supervision of the agricultural instructor.

Field afternoons were held in every centre during last October, several "experimental" areas and farms being visited under the auspices of each branch. The attendances were most gratifying, as many as 130 men, women, and children attending the Tichborne inspections. In centres where branches of the Bureau do not exist plots were established directly with farmers.

The Season.

A full report of the seasonal conditions from June, 1923, to 8th November, 1924, appeared in the *Agricultural Gazette* of January, 1925, page 7, in connection with the crop-growing competitions for the district. Subsequent to 8th November the conditions were not favourable for harvesting until early in December owing to rains, but from early December until the middle of January only two storms interfered with the work. Crops that were not harvested prior to 13th January suffered very considerably from unusually heavy summer rains.

Many plots suffered from lodging, owing to the heavy and sometimes flaggy growth not being able to withstand the November rains, and also from the effect of wheat leaf blight (*Septoria tritici*). However, it is contended that all yields are fair comparisons, irrespective of unequal damage occurring on differently treated plots. Even though a variety develops the most grain and yet "bags" less wheat than its neighbour owing to lodgment, the actual wheat bagged must be accepted as the comparative yield of that variety. This applies only to the results obtained in a wet season. It is quite probable that some of the varieties which gave low yields owing to lodging would do well in drier seasons when no lodging would occur.

Allotment of Experiments.

The method adopted for the conduct of the plots is to allow each local branch of the Bureau to select the farmers who will conduct the experiments. The Bureau also undertakes to see that the farmers conduct the experiments in the best interests of members of the branch, and further, keeps full records of all experiments for future reference.

In the accompanying tables, where the experiment has been conducted under the auspices of the Bureau the name of the Bureau is mentioned, but where no branch of the Bureau exists the experiment is classed as "Departmental."

All experiments were on fallowed land.

Pure Seed Wheat Areas.

The conditions governing the plots required an area of 12 acres of well-worked fallow land. The Department of Agriculture undertook to supply 3 bushels of stud seed of the four varieties of wheat most in demand in the district, as requested by the local branch of the Bureau. The farmer undertook to supply 56 lb. of superphosphate per acre, to pull out strangers from the growing crop, to harvest with the minimum admixture of varieties,

to grade, sow the product in clean, well-fallowed land, harvest, grade the seed, and sell pure graded seed to farmers at a reasonable increase above the f.a.q. price of wheat.

Only one area is required in each centre. These trials also serve the same purpose as variety trials.

Trundle Bureau.—Mailer Bros., "T undle Park," Trundle; soil, red loam; seed, 45 lb.; superphosphate, 70 r acre.

Bogan Gate Bureau.—C. L. Schmidt, "Allandale;" soil, stiff red loam, merging into black heavy soil; seed, various amounts; superphosphate, 56 lb. per acre.

Gunning Gap Bureau.—V. Coombes, "Boxthorpe," Bogan Gate; soil, red loam; seed, 50–60 lb.; superphosphate, 56 lb. per acre.

Tichborne Bureau.—W. W. Watson, "Woodbine," Tichborne; soil, red sandy loam; seed, 60 lb.; superphosphate, 60 lb. per acre.

Coradgery Bureau.—A. Milgate, "Rockvale," Parkes; soil, red loam; seed, various amounts; superphosphate, 45 lb. per acre. Mr. Milgate purchased seed of Amby from Queensland for trial. Late frosts were responsible for the low yields of the early-sown wheats, particularly Canberra and Clarendon, which are fairly early maturers.

Cookamidgera Bureau.—B. C. Adams, "Sunnyside," Cookamidgera; soil, greyish loam, new land (not fallowed); seed, 55 lb.; superphosphate, 60 lb. per acre.

Departmental.—T. R. Jones, "Birdwood," Forbes; soil, loam; seed, 60 lb.; superphosphate, 45 lb. per acre.

R. Job, "St. Elmo," Parkes; soil, light red loam; seed, 55 lb.; superphosphate, 50 lb. per acre.

E. J. Allen, Gregra; soil, red loam to clayey loam; seed, 56 lb.; superphosphate, 66 lb. per acre.

J. M. Connor, "Kokum," Ootha; soil, red loam; seed, 50 lb.; superphosphate, 45 lb. per acre.

YIELDS on Pure Seed Wheat Areas.

	Trundle Bureau.	Bogan Gate Bureau.	Gunning Gap Bureau.	Tichborne Bureau.	Coradgery Bureau.	Cookamidgera Bureau.	Forbes (Departmental).	Parkes (Departmental).	Gregra (Departmental).	Ootha (Departmental).
	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.
Canberra	27	25	32½	30½	17¼	26	23	25	37¼	23¾
Gresley	22	22	...	32½	...	29⅛	...	24	35⅛	27¾
Federation ...	21½	19⅓	36	23	18⅓	24¼	26	23¾	33	23
Clarendon ...	15	16	25	...	14⅔	...	...	...	...	20½
Bald Knob ...	...	...	37¾	...	...	...	...	...	...	...
Yandilla King ...	...	...	...	29	37½	*	33	29½	36	...
Wandilla... ...	...	...	...	...	28¼	...	...	...	33	...
Amby	...	...	...	...	22¾	...	...	...	...	...
Florence ...	...	...	...	...	...	...	21⅓	...	...	23¾
Waratah	...	...	...	...	...	...	...	...	36	31

* Yield not available.

The product of the desired varieties from the above areas will this year be sown on fallowed land, and so, after the 1925 harvest, the pure seed wheat supply should go a long way to meeting local demands. The growers are almost equidistant from each other throughout this portion of the western district, and are near enough for purchasers to take delivery direct, thus saving rail freight.

Wheat Variety Trials.

The area required for these trials was not limited, but the size of the plots was fixed at 2 acres, land to be well fallowed, members of the Bureau to supply 2 bushels of seed of the varieties they desired tested, the Department of Agriculture to supply at least two new varieties. The Bureau undertook to make arrangements for delivering the seed to the farmer conducting the experiment, who treated the seed against bunt infection. The farmer undertook to supply 56 lb. superphosphate per acre, and the product of the plots was to become his own property.

Results of Wheat Variety Trials.

	Trundle Bureau.			Gunning Gap Bureau.	Bogan Gate Bureau.	Tichborne Bureau.	Coradgery Bureau.	Parkes (Departmental).
	W. Ervin.	R. J. O. Berryman.	Medcalf Bros.					
	bus.	bus.	bus.	bus	bus.	bus.	bus.	bus.
Canberra ...	26	.	..	33½	...	32	15½	33
Gresley ...	25	..	28	27½	...	30½	15	...
Hard Federation...	23	..	..	..	19½	...	...	...
Clarendon...	20	19½	...	24¼	17½	..	...	23¾
Bald Knob ...	..	24		30¾	.	...	..	...
Waratah ...	...	23	25½	29¾	22	35¾	19½	30½
Currawa ...		22½		..		...		...
Union ...	...	22¼	..		..	..		...
Gold Top ...	...	21	...	..	..	..		...
Caliph ...	...	..	26⅛	.	...	.	.	...
Redwing ...	...	..	19	...	..			...
Federation ...	.	.	14	...	..	25¼	11	29¼
Gold Top ...	.	...	16½	.	...	.	...	...
Onas ...	...	...	..	28	...	...	..	..
Bunyip ...	...	..	..	27	...	...	..	...
Improved Steinwedel ...	...	.	...	20	...	..	...	...
Gluyas Early ...	...	...	...	...	20⅓	...	.	..
Turvey ...	...	...	..	...	...	33½	33⅜	32⅛
Baroota Wonder ...	...	...	..	.	...	31¾	19⅝	...
Wandilla ...	...	...	...	...	...	28⅛	...	...
Firbank ...	...	...	...	...	...	21⅛	...	...
Yandilla King ...	...	...	...	...	...	25¼	...	...
Minister ...	...	...	...	...	...	22⅛	...	..
Major ...	...	...	...	...	...	...	...	34⅛

Trundle Bureau.—W. Ervin, "Lowan," Trundle; soil, red loam; seed, 52 lb.; superphosphate, 45 lb. per acre.

R. J. O. Berryman, "The Wilgas," Botfield; soil, red loam; seed, 53 lb.; superphosphate, 56 lb. per acre.

Medcalf Brothers, "Gillenbine," Trundle ; soil, red loam to clayey loam ; seed, 50 lb. ; superphosphate, 56 lb. per acre.

Gunning Gap Bureau.—F. W. Judson, "Orontes," Bogan Gate ; soil, fairly heavy red loam ; seed, 54 lb. ; superphosphate, 56 lb. per acre. Shelling was responsible for the loss of about 7 bushels per acre of Improved Steinwedel.

Bogan Gate Bureau.—E. Percival, "Gilgais," Bogan Gate ; soil, light red loam ; seed, 40 lb. ; superphosphate, 40 lb. per acre.

Tichborne Bureau.—R. M. Ashcroft, "Allengrove," Tichborne ; soil, red loam ; seed, 56 lb. ; superphosphate, 56 lb. per acre.

Coradgery Bureau.—W. Woods, Back Trundle Road, Parkes ; soil, fairly heavy red loam ; seed, 45 lb. ; superphosphate, 60 lb. per acre. All plots, excepting Turvey, were badly affected by late frosts.

Departmental.—J. Jelbart, "Trewilga," via Parkes ; soil, fairly heavy red loam ; seed, 45 lb. ; superphosphate, 60 lb. per acre.

Fertiliser Experiments.

The area required for these experiments was 25 acres, which was to be well fallowed and marked into five blocks of 5 acres each. The blocks were treated with superphosphate at approximately the following rates :— 28 lb., 42 lb., 56 lb., 84 lb., and "no manure" per acre. All blocks were sown with the one variety of wheat, the farmer supplying seed and manure.

Trundle Bureau.—K. Gault, "Lynwood," Trundle ; soil, red loam to dark clayey loam ; seed, 45 lb. Hard Federation per acre.

36 lb. superphosphate per acre	18¾ bushels per acre
60 lb. " "	18 "
90 lb. " "	17½ "
46 lb. " "	17 "
No manure	15 "

Bogan Gate Bureau.—C. L. Schmidt, "Allandale," Bogan Gate ; soil stiff red loam, merging into black heavy soil ; seed, 45 lb. Florence per acre.

95 lb superphosphate per acre	22 bushels per acre
No manure	18½ "
56 lb. superphosphate per acre	17½ "
27 lb. " "	17½ "

M. Ferguson, "Myall Park," Bogan Gate ; soil, sandy loam ; seed, 56 lb. Canberra per acre.

60 lb. superphosphate per acre	20¾ bushels per acre.
30 lb. " "	17 "
No manure	15¼ "
90 lb. superphosphate per acre	15 "
110 lb. " "	14¾ "

Gunning Gap Bureau.—W. J. Dwyer, "Daisy Park," Bogan Gate ; soil, red loam ; seed, 50 lb. Federation per acre.

90 lb. superphosphate per acre	25¾ bushels per acre.
65 lb. " "	23 "
57 lb. " "	23 "
37 lb. " "	23 "
46 lb. " "	21¾ "
No manure	21¾ "

Tichborne Bureau.—W. Tyrrell, "Oakleigh," Tichborne; soil, red loam; seed, 60 lb. Canberra per acre.

84 lb. superphosphate per acre	32¼ bushels per acre.
28 lb. ,, ,, ...	31¼ ,,
56 lb. ,, ,, ...	31 ,,
42 lb. ,, ,, ...	29 ,,
No manure	18 ,,

Throughout the trials there was a decided increase, due to the application of superphosphate. The increase would have been considerably greater but for the attack of wheat leaf blight (*Septoria tritici*) during the September-October period, when the grain was in the soft, doughy stage. The manured plots, being denser, taller, and more flaggy than the unmanured, were more subject to a severe attack of this disease, and generally the heavier plots—corresponding to the heavier applications of superphosphate—suffered the most severe losses.

Rate of Seeding Experiment.

The area required in this case was 15 acres of well-fallowed land, marked into three blocks of 5 acres each, the blocks to be seeded at approximately the following rates: 30 lb., 45 lb., and 60 lb. per acre. The three blocks had to be sown with one variety of wheat and manured with 56 lb. of superphosphate per acre, the farmer to supply seed and manure.

Trundle Bureau.—H. Bush, "Hillview," Trundle; soil, red loam; variety, Hard Federation; superphosphate, 56 lb. per acre.

45 lb. seed per acre	19½ bushels per acre.
30 lb. ,, ...	18½ ,,
60 lb. ,, ...	17 ,,

W. Erwin, "Lowan," Trundle; soil, red loam; variety, Canberra; super phosphate, 56 lb. per acre.

52 lb. seed per acre	26 bushels per acre.
60 lb. ,, ...	24 ,,
42 lb. ,, ...	23½ ,,
32 lb. ,, ...	21¾ ,,

A. H. Capell, "Mordialloc," Trundle; soil, red loam; variety, Federation; superphosphate, 48 lb. per acre.

48 lb. seed per acre	28 bushels per acre.
35 lb. ,, ...	25 ,,

Bogan Gate Bureau.—A. Gray, Bogan Gate; soil, red loam; variety Federation; superphosphate, 45 lb. per acre.

48 lb. seed per acre	} 24 bushels per acre.
65 lb. ,, ...	}
35 lb. ,, ...	18 ,,

Owing to storm damage the first two plots could not be harvested separately.

Gunning Gap Bureau.—V. Coombs, "Boxthorpe," Bogan Gate; soil, red sandy loam; variety, Bunyip; superphosphate, 35 lb. per acre.

75 lb. seed per acre	33 bushels per acre.
60 lb. ,, ...	26 ,,
50 lb. ,, ...	26 ,,
42 lb. ,, ...	25 ,,

F. Amor, "Inchgower," Gunning Gap; soil, red clayey loam; variety Bald Knob; superphosphate, 56 lb. per acre.

60 lb. seed per acre	28 bushels per acre.
50 lb. ,, ...	22⅔ ,,
40 lb. ,, ...	20 ,,

Tichborne Bureau.—W. Tyrrell, "Oakleigh," Tichborne; soil, red loam variety, Canberra; superphosphate, 56 lb. per acre.

60 lb. seed per acre	31½ bushels per acre:
45 lb. ,, ...	30 ,,
30 lb. ,, ...	24 ,,

Fungicide Experiment.

In this case an area was required of 15 acres of fallowed land, marked into three blocks of 5 acres each. These blocks were sown with wheat treated as, follows:—(1) Copper carbonate powder; (2) bluestone solution, 1½ per cent., immersed for three minutes; (3) untreated. One variety of wheat only was sown, and 56 lb. of superphosphate was applied per acre, the farmer to supply fungicides, seed, and manure.

Yield.	Trundle Bureau A. H. Capell, Mordialloc.	Gunning Gap. W. J. Dwyer, Daisy Park.	Tichborne W. Chauncey, Daroobalgie	Tichborne. W. Tyrrell, Oakleigh
	bus.	bus.	bus.	bus.
Copper carbonate	29	24⅓	25½	26¼
Bluestone	27	22⅓	22½	29
Untreated	Not sown.	21¼	25½	31¾

Two other trials were conducted, but owing to the November rains it was impossible to harvest the plots separately. In addition to the above trials many farmers conducted private trials, with even more striking results in favour of the copper carbonate treatment over the wet method. In every case the dry treatment of the seed resulted in a higher percentage of germination, more vigorous young growth, and a denser crop. As the dry treatment of seed is now practically universal in the western district, these tests are being abandoned.

Crop-harrowing Trials.

An area of 20 acres of crop, grown on fallowed land, was required, marked into two blocks of 10 acres each, the blocks to be treated as follows:—(1) Harrowed when opportunity offered and when crop was about 6 inches high: (2) not harrowed.

Yield.	Trundle. Maller Bros., Trundle Park.	Trundle. A. H. Capell, Mordialloc.	Gunning Gap. E. Hodges.	Bogan Gate W. McNab
	bus.	bus.	bus.	bus.
Harrowed	31	28	23¾	27½
Unharrowed	30	27½	22	28½

Several other trials were conducted, but owing to storm damage the plots could not be harvested separately. However, no noticeable difference was observed in the growth of these plots. The yields which are available show practically a negative result.

Crop-harrowing is not an operation to be adopted or neglected as a definite routine. Much depends upon the soil and climatic conditions during July and August, and the object of the trials was to determine under what conditions crop-harrowing will increase the yield. It is suggested that it will be beneficial if germination has been uneven, if soil moisture is good but overhead conditions dry, or if the surface soil has set and harrowing is possible shortly after rain.

Depressed yields may be expected from harrowing if soil moisture is low and overhead conditions continue dry. Harrowing checks young vigorous growth, and also growth that is inclined to "spindle." Some leaves are broken, others are buried, which naturally checks growth and induces stooling. Provided there is sufficient moisture in the soil to enable the plants to overcome this check, the resultant growth will be dense and more even, but if moisture is lacking the crop will have difficulty in regaining its original standard.

Oat Variety Trial and Pure Seed Plots.

The area for these plots was not limited. Well-worked clean fallow was required, and plots 2 acres in area. The Department of Agriculture supplied seed of suitable varieties, as requested by the Bureau, while the farmer supplied 56 lb. of superphosphate per acre. When harvesting, the seed was kept free from admixture with a view to being sown on seed areas of clean fallowed land the following year, the product to be graded and sold to farmers as seed oats.

Variety.	Trundle. A. O. Hollibone.	Bogan Gate. C. L. Schmidt.	Gunning Gap. A. Rogers.	Coradgery. A. Milgate.	Tichborne. H. Pearce.	Cookamidgera. N. Mason.	Parkes. J. Aitken.	Forbes. H. Green.	Ootha. J. M. Connor.	Gregra. E. J. Allen.
	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.	bus.
Sunrise	*	30⅓	44	63	*	33½	48¾	43½	*	41
Mulga	*	39	53½	70	*	...	51	37½	*	48¾
Lachlan	*	48	42¾	68¾	*	35	40	55	*	56½
Algerian	*	...	...	...	*	52⅔	41⅓	51¾	*	73½

* Yields not available.

At three places, yields could not be ascertained owing to storm damage making impossible the harvesting of the plots separately. With a number of plots such damage also considerably reduced the yields, but the results of the oat experiments must be viewed from a different aspect to that of the wheat experiments. With the wheat grain yield is everything, but with the oats the general utility of the crop must be the consideration. Oats must

not be regarded by the western farmer as a source of direct income. It must rather be looked upon as (*a*) controlling wheat diseases; (*b*) supplying green winter fodder for stock; (*c*) maintaining the humus content of the soil, and (*d*) making possible the conservation of fodder for drought periods, either as silage, hay, or grain.

The farmer desires an oat which will give the greatest amount of early green feed and subsequent grazing, and which, when grazing is discontinued, will develop into a suitable crop for silage, hay, or grain, maturing sufficiently early for the handling of the oats not to interfere with the wheat harvest.

Such crops will be sown upon quickly and cheaply prepared stubble land, as heavy and bulky oat crops are not desired, owing to the danger of lodgment and shelling. The value of a variety must, therefore, be judged more by observation than by actual grain yield. The oat experiments are sown on fallowed land and harvested solely for grain, owing to the shortage of pure seed of the desired varieties, and because of the advantage of having pure seed growers established in each local centre.

The varieties most suited to the western farmer are at present Mulga and Lachlan—Mulga if grazing and hay are required, and Lachlan if grazing and grain are the objectives.

Cultivation Experiments.

Cultivation experiments have been established in each centre with the object of determining the methods which will give the highest yield in conjunction with the economic working of the fallow.

No. 1 experiment will test the value of (*a*) the summer cultivation in March, prior to the ploughing of the fallow in June; (*b*) the substitution for the ploughing of such a fallow in June of a cultivation only—that is, a cultivated fallow versus a ploughed fallow. For purposes of comparison an ordinary winter-fallowed block is included.

No. 2 experiment will test the value of a winter-ploughed fallow frequently cultivated against a winter-ploughed fallow cultivated as seldom as possible. The object of this experiment is to demonstrate the value of summer cultivations.

No. 3 experiment will test the value of fallow-sown land against stubble-sown land.

These experiments were established in 1924. The blocks have been prepared and will be sown to wheat this coming season.

Flag Smut Control.

In 1924 an experiment was established with Mr. R. Job, "St. Elmo," Parkes, to determine the value of plant residues in aiding the germination and subsequent destruction of the flag smut spores and fungus, and also the value of later sowings of wheat in escaping infection. Plant residues were ploughed under in the winter of 1924, and the plots will be sown with wheat this coming season.

A Potato-growing Competition.

During the past season the A.B.C. (Aylmerton) branch of the Agricultural Bureau promoted a potato competition for the children of the district. Seed was supplied gratis by the Cotta Walla branch of the Bureau and was issued to the competitors at the rate of 7 lb. each, while superphosphate, supplied gratis by a city firm, was also issued to each competitor.

The first prize was won by R. Ratcliffe, aged 11, but no photo was taken of his plot. The above photo shows the crop dug by the second prize winner, Hilda Norman, aged 9.

The utility of competitions of this kind needs no amplification. Activities like this are among the most useful functions of the Bureau. The performance in itself was a good one, but when the competition is regarded as one means by which the drift to-the-city problem is going to be answered, the picture is a doubly interesting one.

A World's Forestry Congress.

By agreement between the International Institute of Agriculture and the Italian Government a committee has been established for organising a world's forestry congress to take place in Rome early in May, 1926.

The congress will bring together experts in forestry and the timber and allied industries from all parts of the world, and it is hoped that truly valuable and profitable results will be reached through the exhaustive discussions, which are expected to take place on all those problems of forestry which are of really international importance. At the same time, in connection with the International Fair at Milan, there will be held an important exhibition of forest products and the machinery used in their conversion. Various excursions to the more typical forest lands in Italy, and possibly in other countries, will be arranged to follow the work of the congress, which is considered to be the most important event in connection with forestry and the allied industries that has as yet taken place.

The Methods of the Late W. J. Farrer.

WITH SOME RESULTS OF HIS WORK.

J. P. SHELTON, M.Sc., B.Sc.Agr., Plant Breeder. *

No excuse is needed for drawing attention to the work and results of the Australian wheat-breeder, W. J. Farrer. The development of this country as a factor in the civilised life of the world and its growing importance in the international problems involved is largely based upon his work. The introduction of what are always known as "Farrer varieties" has greatly facilitated the transition from the pastoral to the agricultural phase in those vast regions of eastern Australia which constitute the present wheat belt. In 1890 New South Wales produced 3,649,216 bushels of wheat; by 1920 this had been increased to 53,715,840 bushels, while for Australia the total production had increased from 27,118,259 to 144,243,734 bushels. These enormous increases have been due to two factors—Farrer varieties, and the improvement in cultivation methods, including fallowing. These have brought under the plough large areas in which low rainfalls had previously been a limiting—almost an inhibiting factor. Other points of interest will be apparent as we proceed.

A few biographical notes will be of interest, and will emphasise on what slender threads the fortune and progress of nations may hang. William James Farrer was born in 1845 in Westmoreland, England, his father being a country gentleman. Educated at Christ's Hospital Blue Coat School, he proceeded to Cambridge University where, after obtaining honors in the Mathematical Tripos, he studied medicine for a year. Ill health caused him to abandon medicine and he sailed for Australia in 1870. There can be no doubt that Farrer's ultimate success in wheat-breeding was, to a large extent, the outcome of his early scientific training, which developed in him a logical clarity of thought that later enabled him to place his breeding work upon a systematised and logical basis. In Australia, financial reverses caused him to abandon sheep-raising for work as a licensed surveyor. In 1886, Farrer retired to his farm home at Lambrigg, near Queanbeyan, where he engaged in wheat-breeding as a hobby until 1898, when he joined the New South Wales Department of Agriculture as Wheat Experimentalist at the age of 53 years, solely that he might have additional facilities for that work in which he had become so engrossed. He died in 1906, by which time many of his productions had come into general cultivation.

In 1890 wheat production in New South Wales was practically limited to the tablelands and the immediate western slopes of the main dividing range. The varieties in general cultivation were the so-called Purple Straw varieties,

* Paper read at the Pan-Pacific Congress, Sydney, 1924.

whose exact origin is unknown, but which were most probably local selections from English varieties originally introduced. Factors limiting production in these districts were:—

1. Loss due to Black Stem Rust. The varieties in cultivation were very susceptible to attack. The general conditions in the regions involved favour rust development, and at that time climatic conditions for a number of years were extremely favourable to the rust fungus.
2. The Purple Straw varieties were late maturing in their habit, which rendered them liable to suffer heavily in grain yield and quality when attacked by rust, since the disease usually developed at a critical stage in grain maturation. The long season, moreover, rendered the varieties particularly liable to suffer from the hot dry spells so frequent in November and December, which cause a shrivelling and pinching of the grain of varieties not far enough advanced in grain formation.

The spread of wheat-growing into the more arid western districts was limited, so far as the prevailing varieties in cultivation in 1890 were concerned, by their long season of growth; for the more extreme climatic conditions rendered all the more serious the liability to drying off of grain (and even of entire plants) in November and December. Moreover, the general absence of resistance to drought of the Purple Straws rendered them unsuitable for general cultivation except in very favourable seasons.

The Rust Problem.

Farrer was first attracted to wheat-breeding by a controversy in regard to rust. His aims and methods can well be told in his own words in letters written to Mr. M. A. Carleton of the United States Department of Agriculture about 1894. These letters form a part of a complete file of the correspondence Farrer conducted with the cerealists of the United States Department which has been generously presented to New South Wales by the Secretary of Agriculture of that country, and which is now deposited in the Mitchell Library:

"Few farmers who have had experience in growing different kinds of wheat will deny that they differ in the resistance they offer to rust. In order to be able to improve a plant in any given direction it is only necessary that it should possess a tendency to vary in that direction. Variability being given by means of selection and by expedients in breeding, man can work wonders [these are almost Darwin's own words]. It is solely in consequence of the fact that the wild species from which they have been derived possessed a tendency to vary in the directions in which they have been improved, that we have succeeded in getting most of our beautiful garden flowers, of our luscious fruits, of our succulent vegetables, and of our excellent and most promising grains from unpromising individuals. It is by selection, either natural or intentional, or both, that we have become possessed of our blight-proof or blight-resistant apples; of varieties of the grape which are

not affected by oidium, which resist mildew, and which possess roots that the phylloxera cannot injure. What is to stand in the way of our taking advantage of the variability as regards the amount of resistance they offer to rust that our wheats exhibit? In effecting this improvement we have everything on our side, since wheat is a plant which reproduces itself at an early age and at short intervals, since a single individual produces a large number of offspring at a time, since our chances of selection are much enlarged by our being able to grow a large number of individual plants to select from, and since the chances of spontaneous crossing between different individuals are remote and little likely to interfere with us in our work of hybridisation and selection. We have also on our side to help us the general principle that a quality which is being cultivated or secured through its variability tends to go on varying in the direction in which it has already varied. It is not in the direction alone of getting varieties possessing increased resistance to rust that I consider the improvement of wheat possible or desirable. It is possible to effect other improvements. Varieties, for instance, differ largely in the content of the grain in gluten. In that respect, also, they are variable and are therefore capable of improvement. We have an example in the sugar beet that an improvement of this character can be effected."

"In regard to the next part your Department will be able to effectually take in providing the different sections of your territory with improved varieties, I would suggest that you should give your main strength to studying the physical qualities that are associated with resistance to rust, and most probably help largely to give that quality; and that you should make crosses with the object of combining in each variety made by you as many as possible of the qualities you observe to be rust-resistance-giving, combined of course in the highest degree, with richness of the grain in gluten and with other qualities which are wanted in a wheat. But as the possession alone of physical resistance-giving qualities is not sufficient to give resistance to rust everywhere and must be accompanied by constitutional fitness in the variety for the climate of the section in which it is grown, it is necessary that the fixing of varieties be done in the sections where the varieties are to be grown on a large scale."

In passing, it is of interest to note that the Minnesota researches, which have indicated the existence of extreme biologic specialisation within *Puccinia graminis tritici*, furnish the explanation of the apparently promiscuous variations in resistance of any one variety from district to district observed by Farrer.

The Extension Westward of the Wheat Belt.

From the rust problem Farrer was led on to general improvement and the production of varieties adapted to the more arid regions beyond the wheat experience line of that period. He early realised the value of early maturity

as the *sine qua non* which was fundamental to the improvement and expansion he sought. Success in this direction, and the consequent spread of cultivation into drier areas, has reduced the rust problem to a very great degree—a reduction which has been accentuated by a run of dryer seasons. Farrer himself lost touch with rust work completely in the last ten years of his career, through the vagaries of climate. Rust liability has been largely decreased by the use of Farrer's improved varieties, because they are early maturing. Thus, when rust does become prevalent, the varieties have usually reached a point sufficiently late in the process of maturation so that they do not suffer in grain yield or quality to any extent.

A detailed account of the crosses Farrer made cannot be given here. In his time he made many hundreds of crosses of greatly varied parentage. However, the varieties which have come into most general cultivation were largely the outcome of crosses made between varieties of the New South Wales Purple Straws, the Fife wheats, and the Indian wheats. A general statement will give some idea of the principles involved in this tripartite system of crossing, and the re-combination of desirable characters likely to result therefrom.

The first line of systematic crossing was between Fife and Indian wheats. The characteristics of Fife wheat were strength of flour, long season, good straw, and liability to shelling. The characteristics of Indian wheats were drought resistance, early maturity, weak straw, but short and sparse, though holding the grain firmly. Neither Fife nor Indian wheats were suitable for general cultivation in New South Wales. The crossing of these varieties produced the following wheats:—Jonathan, Early Jonathan, Comeback, Cedar, John Brown, &c. These wheats combined in general the following characteristics:—From Fife parent, strength of flour, strong straw; from Indian parent, early maturity, sparseness of straw, drought resistance, and non-shelling of grain.

For a time these wheats were very popular. They were distinctly more profitable than the old Purple Straws in most districts on a run of seasons. Farrer used these "Fife-Indians" in breeding further new varieties, which displaced them from general cultivation. The Fife-Indians were crossed with Purple Straw varieties and other selected varieties to evolve varieties which, compared with the Purple Straw parents, were earlier in maturity and more drought-resistant, with sparser straw and non-shelling. The strength of straw was also increased. The quality of flour strength was decreased to a fair extent, however. These new varieties are now almost exclusively cultivated, if there be included in the list those bred on similar lines since Farrer's time. Varieties of such breeding were:—Federation, Yandilla King, Hard Federation, Major, Bunyip, Genoa, Florence, Firbank, Warren, Thew, and Canberra.

The simplest example of this tripartite crossing, and one which is free from the back crossing and composite crossing, to which reference is made later, and which marred much of Farrer's work from the view-point of

modern genetics, is that which gave rise to the variety Federation, so popular to-day. Improved Fife and the Indian variety Etawah, were first mated to produce the Fife-Indian variety called Yandilla. The common Purple Straw was then mated with Yandilla and from the progeny Federation was selected.

Farrer produced thirty-three varieties which at some time were recommended for, and were in general cultivation. Of these fourteen are not now grown, and five are grown only to a limited extent. The remaining thirteen include most of our standard New South Wales varieties of the present day.

Bunt-resistance Another Objective.

Bunt-resistance was a character for which Farrer largely worked at one period, and he succeeded in obtaining it in a large degree in breeding Florence. His work in this problem was detailed and extensive, and all his selections were made from trials of fixed and unfixed strains in which the seed was thoroughly inoculated with bunt spores. For detailed investigation this work compares well with the rust-breeding work being carried on at Minnesota.

Farrer's Work and Modern Genetics.

The analysis of Farrer's work on a basis of modern genetic knowledge is of great interest. It can, however, be done only in a general way, for the notes left are very meagre. He himself made only three references to Mendelism to my knowledge, and these occur in his letters to Professor R. H. Biffen of England, who first applied the Mendelian theory to practical breeding. He wrote, 8th March, 1905:

> "In your letter you speak of the old bugbear of fixing varieties. This work for the last twelve or fourteen years has given me no trouble whatever. It seems to me from what I can see of Mendel's theory of heredity, that the consideration I then gave to the matter of fixing varieties led me to adopt the system, which for all practical purposes, Mendel's theory indicates as being the best. The practice was adopted from what appeared to me to be common-sense considerations. I certainly had not Mendel's theory to work upon."

In writing to Mr. Carleton of the United States Department of Agriculture, on 18th March, 1905, he said:

> "I am just now in the throes of mastering Mendel's laws, the practical application of which I have been following for about a dozen years; if selecting a number of plants, planting the seeds from each in separate drills, and selecting the drill which produces a uniform type constitutes a practical application of this theory."

It may be said that Farrer possessed a knowledge, gained by experience, of some of the main generalisations of Mendel's theory, and that his work was based upon such a system. The main generalisations of the theory from the point of view of the plant-breeder are stated by H. K. Hayes, "The Breeding of Crop Plants," to be:

1. Plants breed true for certain characters when all factors necessary for the development of the character are in a homozygous condition.

2. There is independent segregation of certain factors.
3. Partial coupling of certain determiners sometimes is found. The degree of linkage in transmission is quite constant.
4. Perfect coupling of certain factors occurs, *i.e.*, constant association of characters in inheritance.

In 1896 Farrer wrote the following statement in his report to the Fourth Rust in Wheat Conference, which indicates that he was quite well acquainted with the phenomena of segregation and re-combination of characters in crossing, though he had no knowledge of the exactness of the re-combination nor of the definite basis on which new types could be looked for :—

"In order to combine the qualities of earliness of maturity and resistance to rust in one variety by means of cross-breeding, late rust-resistant and early rust-liable sorts, as I have already pointed out, have to be mated. It will be well to pause for a moment and consider what we ought to expect from the union of types which differ so widely in these two qualities, as well as in others, such as the relative hardness, size, character of the grain, &c. What we generally see in the analogous case of the animal kingdom, with which we are more familiar, is that when parents, which are not closely similiar, are united, if the progeny be numerous, certain individuals inherit some of their characteristics almost entirely from one parent combined with other characteristics which they have inherited almost entirely from the other parent ; whilst as regards a majority of their characteristics they are intermediate in various degrees between both parents; and when this happens in different degrees and in a different manner with all the progeny, it will be seen how it comes that no two individuals of the same parentage are ever exactly alike, and that the greater the dissimilarity of the parents the greater will be the difference between the offspring of the same union. I will attempt to illustrate briefly what I mean, and for this purpose will make the case as simple as I can, and apply it to the subject we are actually dealing with.

"Suppose I have mated a rust-resistant-late with a rust-liable-early variety of wheat. The greatest diversity of types will be shown by the offspring which grows from seed of the first generation of the cross from such seed as I am distributing. Suppose we have 100 plants growing from such seeds, which are of the same parentage. Out of this number I would expect there might be one or two—say one—which has inherited in a very high degree, possibly in as high a degree as the parents themselves possessed them, the qualities we are seeking to secure from both parents. A few more—five—I would expect to inherit high rust-resistant power from one parent, associated with moderate earliness from the other , and five more to inherit a high degree of earliness with fair rust-resisting power. The remaining eighty-nine I would expect to inherit these qualities in various degrees intermediate between the two parents ; and something of this sort is what I find actually to occur-

in most cases. The work, then, of the person whose business it is to make use of these 100 plants is essentially the work of selecting as many of these eleven plants as promise to fill our requirements, and that work, as I have found out from actual experience, requires for its successful performance a close attention, care, patience, thoroughness, and system."

Professor R. D. Watt of Sydney University, in commenting upon this statement, has drawn attention to a concrete example of re-combination of characters obtained by Farrer. The comment is quoted from Science Bulletin No. 22 of the Department of Agriculture, New South Wales, "William J. Farrer, and the Results of his Work," by F. B. Guthrie.

This quotation shows that, although Farrer was at that time in ignorance of Mendel's historic experiments, he was working more or less along Mendelian lines—for the main practical lesson of Mendelism is that, if two varieties of any crop, each of which possesses one desirable and one undesirable character, are crossed, there will appear among the progeny one or more individuals possessing the two desirable characters, and that some or all of them will breed true to both these desirable characters. The proportions mentioned by Farrer do not agree with Mendel's figures, probably because resistance to rust (*Puccinia graminis*) is not a simple Mendelian factor in inheritance.

"Two instances of Farrer wheats may be quoted to show how Farrer used something very closely akin to the Mendelian method. Of the many varieties he had at his disposal, a crossbred called Maffra was noted for its early maturity, which was its main asset; Zealand was one of the best late maturing wheats for hay, and Rymer one of the best late maturing prolific grain yielders. Farrer desired to get a variety of wheat suitable for hay which would mature sufficiently early to enable the farmer to have his hay in the stack before the grain harvest commenced. He therefore crossed Zealand with Maffra, and among the progeny he found a few plants which combined the excellent hay qualities of Zealand with the early maturity of Maffra. From these few plants he saved the grain and sowed it in small plots, found that it bred true, and thus he evolved the variety Firbank, which is still perhaps the best early-maturing hay wheat for New South Wales conditions.

"His second objective was to get a prolific grain-yielding early-maturing variety; and so he crossed Rymer with Maffra. The result was Bunyip, which for a time was the most prolific grain yielder of all the early-maturing varieties, although it has been recently surpassed by newer varieties like Canberra."

Farrer's system of handling crossbred generations on a single-plant basis is the natural outcome of the first Mendelian generalisation quoted above—that plants breed true for certain characters when all factors necessary for the development of the characters are present in a homozygous or pure condition. Of homozygosity, however, Farrer knew nothing.

The most striking points which the modern geneticist will notice in examining the pedigrees of the many varieties of which Genoa is representative are :—

1. The complicated nature of the pedigree and the frequent double use of a variety as a parent.
2. The frequent use as parents of unfixed crossbreds, often of the first generation, as stated by Farrer himself in writing to Professor Biffen. The pedigree of the variety Genoa is as follows :—White Naples was crossed with Improved Fife and an unnamed, probably unfixed, individual derived therefrom was then back-crossed with White Naples; an unnamed, probably unfixed, type resulting from the back cross was then mated with another unnamed, possibly unfixed, type derived from a cross between Improved Fife and Eden. The mating of the two unnamed types gave the well-known variety Genoa. Such a pedigree makes it apparent that Farrer had not a really clear conception of the definite segregation and re-combination of characters as separate entities based on genetic factors. His concept in this direction was undoubtedly obscured by the prevalent idea that the double use of a variety as a parent, *i.e.*, a system of back-crossing, emphasised or increased the final development of these characters individually in the ultimate progeny. This idea is usually expressed in such terms as half blood, three-quarter blood, &c., of one particular parent being present in the ultimate progeny. Both the idea and the terminology are contrary to the present-day Mendelian concept.

Complicated composite crossing, particularly of unfixed types, is a practice quite opposed to those based on modern genetics, and indeed is in strange contrast to Farrer's own knowledge of the segregation of unit characters. It is largely based on the nineteenth century conception that crossing was of value mainly as a physiological stimulus that promoted variation of a quite promiscuous and ungoverned nature. Composite crossing aimed at inducing maximum variation in order to obtain a wide range of types for selection.

It is not suggested that Farrer could not obtain re-combinations of characters by crossing F1 plants. The pedigrees of some of his best productions show that such re-combinations were obtained—fortunately for Australia. But the mathematical aspect of Mendelism, based on the laws of chance, shows that Farrer undoubtedly reduced, in a very large degree, the chances of obtaining any desired re-combination by crossing F1 plants, as compared with the crossing of fixed strains or pure lines possessing the necessary characters. On the other hand, when no fixed or pure line strains were available, any success resulting from Farrer's system saved several years of patient labour, and expedited results by so much time as would have been necessary first to create and fix such varieties.

Perhaps the most interesting reference to Mendel's law made by Farrer occurs in a letter to Professor Biffen written in 1905. It contains a

criticism of the theory which was later advanced by many critics, and which remained unanswered for a considerable period. Farrer's statement is here given in his own words:—

> "There is one point in connection with Mendel's law that it seems to me not to provide for. It is that when varieties, which differ sufficiently in type, are crossed, the variable generation seems to produce individuals which differ in all the qualities in which varieties differ, *e.g.*, by crossing two late sorts of different types it is quite possible to get early sorts. I cannot recall just now an instance in which I have got a very early variety in this manner, but I have made from such crosses varieties which are distinctly earlier than either parent. Mendel's law, I fear, is not likely to be of great use to me in enabling me to improve my methods, because, in nearly all the crosses I make, one of the parents is an unfixed crossbred, and frequently a plant of the first generation from the cross."

The statement that Mendel's law does not provide for cases in which the progeny of a cross includes individuals which possess characters not found in either parent was undoubtedly true as Mendel's law was then stated and understood. Subsequent research, however, has shown that some characters depend, for their full expression, upon the presence of more than one Mendelian factor. Thus late varieties are differentiated from early varieties by several factors. Where two late varieties are crossed, it is evident that different re-combinations of the several factors for lateness may occur in the variable generation. Some plants will then contain less than the full number of factors for lateness, and will show a degree of earliness in correspondence with the decrease in the factors.

Farrer's case of the appearance of early wheats as the result of crossing two late wheats of different type is therefore not really at variance with Mendel's theory as now understood, although at the time his objection was perfectly valid.

Future Possibilities.

Any review of Farrer's work naturally leads on to a discussion of future development, and it is in this regard that discussion might well be engaged upon. At the present time it may be taken that we have in Federation, Canberra, Yandilla King, Clarendon, and several other varieties, wheats which are fairly well adapted in general habit to the climatic and soil conditions of a great area of wheat land, as yet only very partially exploited. They are also fairly well suited to the commercial requirements of our local and overseas markets.

Improvement, however, will result in the building up of these varieties on a single character basis. Characters may be added, such as resistance to prevalent diseases—flag-smut, take-all, foot-rot, and rust in certain districts. The question of yield, particularly in relation to earliness of maturity, has by no means been solved, but it is a problem fundamental to the breeding of wheats for the drier regions beyond the present wheat belt. Also, yield in combination with superior grain quality is a matter for

further investigation. Particularly bound up with the inheritance of disease resistance is the problem of the linkage of resistance factors with those which give expression to commercially or agronomically undesirable characters. Such linkage may be complete or partial. Only genetic experiments can give the answer, yet on the answer depends the possibility of future progress. This is well illustrated in the Minnesota work on rust-resistance, where the linkage between resistance and Durum type was proved to be not absolute, as at first thought, and thus not a bar to the breeding of rust-resistant bread wheats. Again, the problem of partial sterility in species crosses is one which must be investigated before improvement in certain desirable directions is completely possible. Sterility of this kind has undoubtedly a genetic basis, and investigation may indicate systems of crossing which will overcome the difficulty.

These matters, being briefly given, indicate the necessity for a genetic analysis of the genus *Triticum* before the best progress may be expected. We must know what the genus really contains in the way of inheritable or genetic characters, and the behaviour of these characters in regard to inheritance, before we can visualise what improvements are possible, or be in a position to combat the difficulties that nature throws in our way in seeking that improvement. For instance, we do not yet know what varieties or species show any resistance to take-all or foot-rot, and only partially so in regard to flag-smut.

Yield, as an expression of complex genetic factors in relation to the environment, seems a hopeless problem to attack in an experimental way. Yet all breeders are convinced that they have discarded what would have been valuable strains, simply through an inability to see beyond the temporary effects of a reaction between a valuable complex of factors and a temporarily unfavourable environment. Something more definite as a selection index is needed than is obtained by eye-inspection and arbitrary evaluation, even by men with the so-called "eye" for a good wheat. Such a standard has been sought from time to time, and there is great need for further work in correlating potential yield with individual characters or groups of characters of a morphological or physiological nature.

The migration ratio of Beaven, which has some experimental basis in regard to the behaviour of pure lines or fixed varieties, may eventually prove applicable on a modified basis to individual plants of an unfixed crossbred generation.

Again, the relation of transpiration ratio to yield has not yet been investigated sufficiently in regard to different varieties of any one crop. In this country, Dr. Richardson, of Victoria, has done valuable preliminary work upon the differences in transpiration radio of various crop plants. To be valuable to the breeder, this work must be carried out with many varieties of one crop, such as wheat, so that definite correlations may be found, should they exist. There may thus be provided some experimental basis for using the transpiration ratio as a partial index of potential yield with individual plants.

I am well aware of the immense experimental difficulties that lie ahead in such work, and the great amount of experimental error involved in applying general principles to individual plants. These problems are, however, worthy of investigation if plant-breeding is to evolve as a more exact science. The handling of the third generation of crossbreds in pots in the glass house at Minnesota in regard to rust-resistance work is an example of progress that may be looked for. It has placed the testing for resistance in a variable generation upon a definite laboratory basis.

The extracts from Farrer's own letters, which have been presented in this paper, show that his work was based upon an immense amount of preliminary observation and speculation. Breeders of this generation must attack their problems in the same way.

Organised Farmers Injure No Interests.

I BELIEVE it is easily demonstrable that there can be no continuous organisation of the farmers in the marketing of their product which will militate against public interest. The reason is simply that if the producer or combination of producers of any farm product demands more than his fair proportion of the total national income he will at once stimulate competition and real overproduction which will overwhelm him. Agriculture in this particular differs from all other forms of industry in the readiness with which new competition may constantly come into the picture. No new plant or equipment, no new supply of labour, no new investment of capital is necessary in order to turn agriculture from producing one commodity to another. In this it differs essentially from, say, the steel industry, where vast investment of capital is necessary to increase production and where in consequence competition does not respond quickly to undue prices.

All of the alarm that has been expressed at the possible combination of the farmer to override the consumer against public interest is to my mind entirely unnecessary and not worthy of consideration.—HERBERT E. HOOVER, Secretary, U. S. Department of Commerce.

No Magic in Co-operation.

THERE is no magic in co-operation—it is merely one method of doing business, and in adopting that method it must be clearly understood that good business practices must be followed. There is nothing in co-operative marketing, for instance, that will enable a bad farmer to make as much money as a good farmer; but by co-operation a bad farmer may be brought to realise that he will get better returns if he improves his methods, and a good farmer will learn that it pays to have all good farmers in his district, in order that the reputation of his district's products may be enhanced.—G. G. NEILL, Information Officer, Registry of Co-operative Societies, at the Tumut Bureau Conference.

Germination Tests with "Shot" Wheat.

EFFECT OF TREATMENT FOR BUNT

A. H. E. McDONALD, H.D.A., Chief Inspector of Agriculture, and A. W. S. MOODIE, H.D.A., Assistant Agrostologist.

LAST season a considerable amount of wheat was bleached, and, in many cases "shot," through rain falling during harvest. It was considered probable that the value of such wheat for seed purposes would be reduced and that possibly the treatment for bunt would have a further harmful effect upon its germinating qualities. In shot grain, partial germination takes place in the head, and, as a consequence, the coat protecting the germ is broken, and it was expected that the usual seed treatment would have a severe effect upon the germ. It was therefore arranged to collect for experimental purposes representative samples of sound and bleached wheat. Samples were obtained from Messrs. F. W. Giles, of Coradgery; K. Gault, of Trundle; and J. R. Postlethwaite, of Nelungaloo. In each case sound and bleached grain of the same variety was obtained, germination tests being conducted in the Department's laboratory with (*a*) untreated seed; (*b*) seed treated with copper carbonate; (*c*) with a 1 per cent. bluestone solution; and (*d*) with a 1½ per cent. bluestone solution. The results obtained indicate (1) that shot grain is very seriously affected in its germinating qualities by the bluestone solution, and (2) that shot grain gives a relatively poor germination, even when sown without treatment, as compared with sound grain.

Following are the results of the tests, with notes showing speed of germination, etc. These observations are essential to a true understanding of the figures, as in some cases, taking the totals, the seed would not appear to have suffered appreciably by the treatment, whereas, taking the speed of germination into consideration, almost all the bluestone-treated samples were affected. It must be remembered that in all cases conditions were entirely favourable to germination. Under actual field conditions a good deal of the grain which germinated slowly would probably not have germinated at all.

The following tables show the percentage of germination in each case.

F. W. Giles, Coradgery.

Period of Treatment.	Class of Seed.	Untreated.	Treated with Copper Carbonate.	Treated with 1 per cent. Bluestone.	Treated with 1½ per cent. Bluestone.
		per cent.	per cent.	per cent.	per cent.
Eight days	Sound ...	95	98	91	75
	Shot ...	98	96	90	80
Twelve days	Sound ...	95	96	96	87
	Shot ..	98	96	93	[illegible]

The untreated samples, sound and shot, gave excellent spontaneous germinations on the third day and were finished on the fifth day. The seed treated with copper carbonate also gave spontaneous germination, though the percentage which had germinated by the third day was not as great as in the untreated samples. The sample treated with bluestone gave a retarded germination spread over the full time, a small number of seeds germinating each day.

It is noteworthy that no mould developed in any of the tests carried out with seed submitted by this farmer.

K. Gault, Trundle.

Period of Treatment.	Class of Seed.	Untreated.	Treated with Copper Carbonate.	Treated with 1 per cent. Bluestone.	Treated with 1¼ per cent. luestone.
		per cent.	per cent.	per cent.	per cent.
Eight days	Sound...	90	90	82	70
	Shot ...	81	58	30	25
Twelve days	Sound...	90	90	82	77
	Shot ...	81	58	40	31

The sound untreated seed germinated very quickly, four days being sufficient for the test. The shot grain germinated mostly between the fourth and the eighth days. A large percentage of this seed went very mouldy, although it still germinated.

The seed treated with copper carbonate was again slightly slower than the untreated seed.

Bluestone affected the germination wherever used, both as regards degree and speed of germination. In the case of the sound grain germination was retarded, taking place between the fourth and the eighth days. After the fifth day all the samples developed mould, the shot grain being the worst in this respect.

J. R. Postlethwaite, Nelungaloo.

Period of Treatment.	Class of Seed.	Untreated.	Treated with Copper Carbonate.	Treated with 1 per cent. Bluestone.	Treated with 1¼ per cent. Bluestone.
		per cent.	per cent.	per cent.	per cent.
Eight days	Sound ...	91	81	80	60
	Shot ...	64	62	45	32
Twelve days	Sound ...	91	81	88	83
	Shot ...	64	62	45	50

The sound untreated seed gave good spontaneous germination. Treatment with copper carbonate appeared to have affected the germination of the sound grain, but as a great deal of mould developed on this sample the result may hardly be indicative taking into consideration the previous tests. Bluestone again greatly retarded germination.

General.

Eight days is generally accepted as the standard time for the germination of wheat.

All the tests were carried out in duplicate, and the figures given represent actual growth; that is, the grain had to develop both radicle and plumule before being counted.

That the effect of bluestone is more marked than perhaps the figures indicate is shown by the development in each case. In every sample treated by this method a very large percentage of seeds showed the plumule before the radicle, and often attained a length of one to two inches before the radicle appeared. In general in these cases the radicle appeared two to four days after the plumule.

In the case of the shot samples from Messrs. Gault and Postlethwaite, a great number of seeds produced radicles bu no plumules and hence were not included as growths.

he untreated samples gave the maximum number of growths between the third and fifth days, as did also those treated with copper carbonate. Those treated with bluestone gave the maximum growths between the fifth and eighth days.

Conclusions.

The tests show the losses which are likely to arise when badly bleached or shot grain is used for seed purposes, especially when the bluestone treatment is adopted. When such seed is badly damaged, there may be almost a total failure to germinate, while there is a strong probability that at any rate a great deal of the grain will not germinate and the crop will be very thin. If such seed must be used, then the amount per acre must be much heavier than is usually sown. Bluestone has a severe effect on bleached grain. Coppe carbonate seems also to affect the germinating quality, but not to nearly the same extent as bluestone, and this treatment should be adopted for preference over bluestone.

Slightly bleached grain which has a bright colour is quite suitable for seed, but bleached or shot grain which shows darkening of the seed coat through weathering should not be used, as such seed will almost certainly germinate very badly.

Return of Infectious Diseases Reported in April.

The following is the return of outbreaks of the more important infectious diseases reported during the month of April, 1925:—

Anthrax	Nil
Contagious pneumonia of swine	"
Pleuro-pneumonia contagiosa	"
Piroplasmosis (tick fever)	"
Swine fever	"

—Max Henry, Chief Veterinary Surgeon.

New Varieties of Wheat, Oats, and Barley.

J. T. PRIDHAM, H.D.A., Plant Breeder.*

A REVIEW of the last three or four decades discloses considerable changes in the varieties of cereals favoured by New South Wales farmers. The common varieties of wheat in cultivation thirty years ago, for instance, were White Lammas, Purple Straw, Steinwedel, Marshall's No. 3, Golden Drop, Allora Spring and Farmer's Friend. Of these only one—Marshall's No. 3, is now in general cultivation. Again, of the large number of varieties of oats grown at that period at Wagga Experiment Farm, only one (Algerian) is in vogue to-day. Twenty years ago Algerian was still the chief sort grown. It was only in 1915 that Sunrise oats began to be cultivated in field trials; to-day it is quite commonly used. Federation wheat dates twenty-five years back and Hard Federation some ten or twelve. In such changes as those referred to is reflected much departmental experiment and research.

Early maturity is the outstanding feature of the new sorts as compared with the old ones. As rapid growth generally speaking means money in the case of stock, so is it an advantage in the case of crops. The early-ripening sorts miss the full stress of a hot summer, do not occupy the ground so long, and often escape diseases. It is quite likely that we have about reached the limit of production in Federation, but this does not mean that new varieties are not needed. Old ones break up sometimes and it is not always possible to rejuvenate them in exactly the same form; new types are wanted for special climates and soils, for disease resistance, and for better grain quality.

New varieties result from (*a*) natural and (*b*) artificial crossing between two separate individuals. Natural crossbreds are superior plants in a crop which catch the eye, and which are perpetuated for some improvement which it is discovered they have inherited. The most conspicuous plants of this character revert in after years to the normal, but occasionally a valuable new sort may be isolated. Artificial crossbreds are produced as the result of a definite effort to unite the good points of two varieties in one. Steinwedel wheat and Sunrise oats are instances of the first, and Federation wheat and Lachlan oats of the second.

In breeding a new variety we have no particular shape of ear in view, provided it yields better than others in a given district and has no serious defects from the farmer's point of view.

Natural Crossbreds.

It is a fundamental axiom that plants vary—were it not so there would be no occasion for the plant breeder—and in a state of nature variation provides that there should be the fittest to survive. The benefits of crossing

* Notes of an Address delivered at the Royal Agricultural Show, Sydney, 1925.

are such that, as Darwin observed, nature has made provision for its occurrence in almost all species of plants, though it is attended with much difficulty in some. On several occasions ears of wheat have been sent to the writer for identification which he has been unable to place; these were, no doubt, often cases of natural crossing, such as are known to have occurred from time to time in the breeding plots at Cowra Experiment Farm.

Hard Federation is a striking example of a wheat showing improved quality of grain which has gone into general cultivation. This variety originated in pedigree rows of Federation, and from the first it had flinty-looking grain, different from its parent, though the ear and the appearance of the plant was similar. It was grown for some years as a superior strain of Federation, when a wheat buyer flatly refused to believe that it originated from the starchy-looking seed of Federation. This led to the discovery that it was evidently a natural cross (possibly with Comeback), and at this time it began to vary in colour of ear, degree of tip-awn, and other characters. It took some years finally to select the wheat to a uniform type. Nature will not be tied down to a cast-iron mould, and under our conditions we find that all varieties, sooner or later, exhibit a tendency to variation unless rigidly selected.

Sunrise oats is another case It originated in some breeding rows of Algerian oats; but the plant was so utterly different from any other variety with which we had been experimenting, that it was seen to be a natural crossbred. Its sparse stooling habit almost doomed it to destruction, but on second thoughts the plant was kept. In the progeny afterwards, a small number of its offspring yielded black seed (not hairy) though the predominant type was white. This appears to be an incurable weakness of the variety, seen also in its offshoot Mulga. Selection, however, in the ordinary way, keeps the type sufficiently pure.

Artificial Crossbreds.

Waratah wheat is an instance of an artificial crossbred—a cross between Purple Straw and Gluyas. Millers sometimes bemoan the passing of the old original Purple Straw—a free-milling sort with flour of a beautiful colour. Waratah provides grain of the same nature for the benefit of the miller, but (for the benefit of the farmer) exhibits a hardier constitution with no reduction in yield.

Union represents the mating of old Federation with a crossbred of imposing pedigree and a white head of dense and bag-filling appearance but somewhat delicate constitution. Judging by its performances during the last two seasons in the Riverina, the combination has been a successful one.

Clarendon is one of the Farrer crosses, only found to have rust-resistant or escaping qualities since Mr. Farrer's death. To his great disappointment Bobs wheat did not turn out hardy in this respect, but on mating it with a Gluyas-Fife-Indian cross the progeny by selection became well adapted to the coastal, north-west, and western plains areas

Lachlan oats is a case of an attempt to breed a plump feed oat in place of Algerian, which in dry seasons is thin and pinched. It was disappointing even in the cooler districts to see the Gartons or New Zealand Potato oats develop a light thin seed in a dry year, so an oat of this class was crossed with Algerian. The former is a light stooler, but Algerian grows a good many stalks to the plant. The result was Lachlan, which is a medium stooler, giving plump grain in a comparatively dry year, and maturing earlier than either parent.

Varieties of cereals from abroad and from other States are continually being tested, but it must be acknowledged that the locally-bred cereals hold their own, the only district where varieties from a neighbouring State have much acceptance being the Riverina.

Barleys.

Barley affords an illustration of plant introduction. It is not often that a foreign variety suits our conditions without being adapted by crossbreeding and selection. Some years ago a large number of varieties of barley were imported from Algeria, and of these the one named Trabut proved the most useful. It has beards like Cape, but the grain is a bright yellow colour and of excellent malting quality. Trabut yields better than Cape in the southern coastal districts and tablelands, and is about equal to that variety elsewhere. A cross between Wild barley and Kinver resulted in great variation, the best commercial type so closely resembling the fine malting barley Pryor that we simply called the new product "Pryor—a rejuvenated strain."

Barley is not in great demand in the State except for brewing; the Skinless variety is popular for green fodder and silage, but its place is often taken by an early-maturing oat. Smooth-awned barleys are being bred in America, but the sorts so far tried by us have not proved sufficiently productive. An endeavour is now being made to raise a relatively beard-free type. The beards or awns are an annoyance at harvest time and are apt to give stock sore mouths. If we can at any rate reduce them it will be an advantage. A Cape barley type with very short awns has been found by Mr. Schultz, of Henty. It has been named Reka, and suits a district with a good rainfall, being a heavy stooler. Here is another instance of a variety being originated by a man on the land.

New varieties are tested (1) by the plant breeder, (2) at the Department's experiment farms, and (3) on farmers' experiment plots. Growers are keen on new sorts, but the farmer must be protected. Advertised varieties that have survived the above series of tests may be regarded as pretty safe for the farmer's use.

The economic value of an improved variety is very considerable and far outweighs the trifling cost involved in its breeding. An increase of a bushel per acre in New South Wales would have amounted to about three-quarters of a million sterling in the season 1923-24, and considerably more last year (1924-25), so that a slight improvement in seed may increase tremendously the sum total of the farmer's and the world's wealth. The supply of seed of a new sort is quickly increased. A farmer a few years ago obtained a

matchboxful of seed of a new wheat and in four years had enough grain to sow his farm, with a good many bags to spare for sale to his neighbours.

The value of plant breeding may be summarised briefly thus :—

1. The standard of yield is maintained or increased by adjusting and rejuvenating crop varieties in co-operation with careful farmers.
2. The cropping area is extended into fresh districts by the use of better and earlier sorts.
3. Inland farmers are enabled to carry more sheep per acre and coastal farmers to keep up the milk flow of their dairy cattle by the use of autumn-sown cereals.
4. Growers are better able to fight plant diseases and many weed pests.

Milk Yield as Affected by Times of Milking.

Much discussion always arises when the subject of the advantages of frequent milking is mentioned to dairy-farmers, writes E. T. Halnan, in the *Journal* of the English Ministry of Agriculture. An interesting study on this subject has been carried out at Missouri University by Ragsdale, Turner and Brody, who, as the result of experiments extending over three months arrived at the conclusion that a cow that is milked three times daily will give 110 per cent. of the milk that is given by the cow milked twice daily. If the number of times of milking is increased to four times a day, the yield will be increased to 116 per cent. Thus, on this basis, a cow giving 10 quarts of milk a day when milked twice daily will give 11 quarts if milked three times a day, and 11.6 quarts if milked four times a day. The results of this experiment indicate that where labour conditions can be adjusted to the new routine, milking three or even four times a day will be followed by beneficial results. In a herd giving 100 gallons of milk a day an extra 10 gallons a day is worth striving for.

Soldiers' Memorial at Cowra Experiment Farm.

The ceremony of unveiling a handsome memorial to the men who enlisted for the war from Cowra Experiment Farm was performed last month in the social hall of the farm by Mrs. Allan Gray.

The memorial consists of an oaken case mounted on a tastefully designed stand, and is furnished with a valuable collection of books as the nucleus of a library for the farm students. The front of the case is inscribed : "In memory of employees and apprentices who enlisted from Cowra Farm, 1914-18."

The idea of the library and bookcase as a war memorial originated with Mr. M. H. Reynolds, who was manager at the farm during a period of the war, and at the unveiling ceremony Mr. H. J. Kelly, the present manager, attributed the whole of the credit for the money raised to Mr. Reynolds, who, he said, had worked hard for the accomplishment of the objective. Seventy men engaged on the farm as officers, students, or employees went to the front, and of these eighteen made the supreme sacrifice, so that the memorial will have an abiding significance for all subsequent residents and visitors at the farm.

The function was attended by a number of residents of the town and district of Cowra who had interested themselves in the scheme.

Farmers' Experiment Plots.

Potato Experiments, 1924.

Murrumbidgee Irrigation Area (Yanco Centre).

W. R. WATKINS, H.D.A., Agricultural Instructor.

TRIALS with potatoes were conducted by the Department last season in co-operation with the following farmers:—

F. Jackson, Farm 1213, Leeton.
G. Denne, Farm 1238, Yanco.
W. T. Bell, Farm 944, Leeton.

Seasonable conditions were more favourable for potato crops than last year and consequently yields were higher. The rains of August were most beneficial and allowed the land to be well prepared for planting; good germination resulted throughout the trials. Frosts were experienced up to the middle of October, but the crops were not affected, and during the same month some very high winds were experienced.

The rainfall during the growing period was as follows:—August, 225 points; September, 141; October, 104; November, 559. Total, 1,029 points.

The $5\frac{1}{2}$ inches that fell during November was mostly registered at one fall and was therefore not so beneficial to the crops as if it had been distributed throughout the month. The showers throughout September and October kept the plants growing, and irrigation was in most cases only resorted to towards the latter end of October, after the drying winds that prevailed during that month.

Harvesting was carried out early in December.

The Plots.

Farm 1213.—A variety trial was carried out on this farm on a red loamy soil which had previously been cropped with tomatoes. The land was ploughed during the winter and worked into splendid order for planting, which was carried out on 14th August, in drills 3 feet apart with 15 inches between sets. The germination was good throughout. The plots were scuffled, hilled on 30th September, and scuffled again in October. The crop made good growth, Irish Cobbler and Gold Coin making a good showing and being the earliest to mature. The trial was manured with P3 mixture at the rate of 4 cwt. per acre.

Farm 1238.—A variety trial was carried out on a red to grey loamy soil which had previously been cropped with maize and pumpkins. The land was fallowed during the winter and worked down to an excellent seed-bed. Planting was carried out on 15th August in drills 3 feet apart with 15 inches between sets. Germination was very good in all plots. The crop was lightly

harrowed when the plants were just breaking through. Watering was carried out on 23rd October. The crop made good growth. Gold Coin was the earliest, producing tubers of every shape and size. Irish Cobbler is another early-maturing variety and showed promise of being a suitable variety for the district. The Manhattans were mostly large, while the Factor produced a large number of small tubers. A few plants were affected with dry rot. The trial was manured with P3 mixture at the rate of 4 cwt. per acre.

Farm 944.—A manurial trial was carried out on a red sandy loam. The land was new; it was fallowed in May and worked down into a fine seed-bed. Planting was carried out on 19th August in drills 3 feet apart with 15 inches between sets. Germination was good and the crop was lightly harrowed when the plants first appeared. All the manured plots made good growth, especially the P3 and P7 plots and the one to which the heavy dressing of superphosphate had been applied, while the unmanured plot was very backward. A watering was carried out on 28th October. Although the soil was a sandy loam, suitable for root crops, the trial afforded further proof of the increased yields obtainable by the use of fertilisers.

RESULTS of Variety Trial.

Variety.	Farm 1213.				Farm 1288.			
	t.	c.	q.	lb.	t.	c.	q.	lb.
Factor	5	18	2	12	6	15	1	15
Early Manhattan	5	4	3	4	5	0	2	25
Irish Cobbler	4	19	0	18	5	17	0	1
Gold Coin...	4	14	3	26	4	4	2	5
Early Manistee		....			3	8	3	0

The above trials were manured with P3 mixture at the rate of 4 cwt. per acre.

RESULTS of Manurial Trial.

Fertilisers per Acre.	Farm 944. Early Manhattan.			
	t.	c.	q.	lb.
* P7, 2½ cwt.	12	19	0	10
* P3, 4 cwt.	11	18	1	10
* M13, 3¼ cwt.	11	15	0	5
Superphosphate, 5 cwt.	10	1	2	18
Superphosphate, 2½ cwt.	9	9	3	14
No manure	8	8	0	0

* P7 mixture consists of equal parts of superphosphate and bonedust; P3 of 10 parts superphosphate, 3 parts sulphate of ammonia and 3 parts sulphate of potash; M13 of 10 parts superphosphate and 3 parts sulphate o potash.

The Husking of Maize.

A New Type of Hook.

H. WENHOLZ, B.Sc. (Agr.), Special Agricultural Instructor.

In America, where some State-wide maize-husking contests have been conducted in recent years, attention has been drawn to the high records being made in the amount of maize husked in a certain time, and it seems that a type of husking hook, which is in general use in that country, is to a large extent responsible for the celerity and efficiency of the work. As this husking tool is practically unknown here so far, it is thought that a short description of it may be of use to maize growers in this State who have not reached the stage of husking machinery, and who still have to husk, either in field or barn, much or all of their maize.

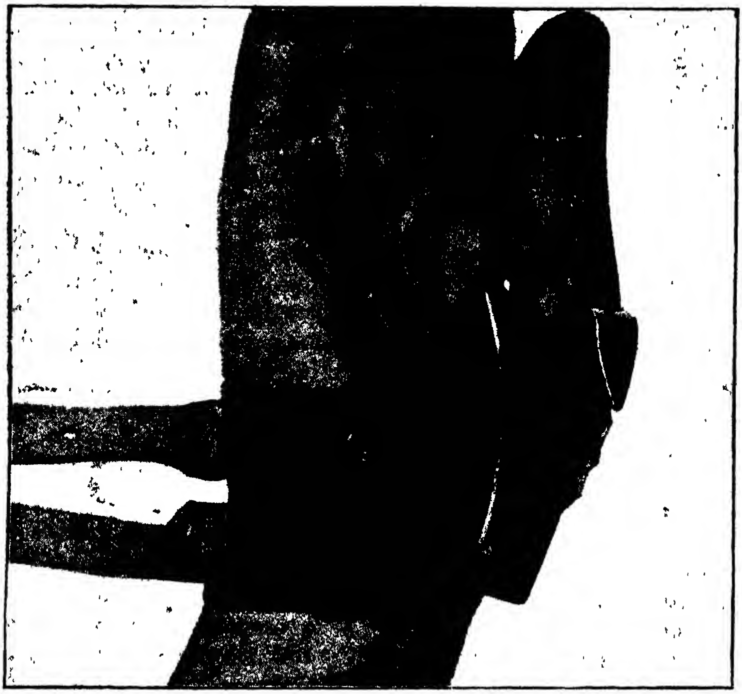
It is not surprising that in America, where approximately 100,000,000 acres of maize are grown annually, the operations connected with the crop should have been subjected to considerable scrutiny for their possible improvement, and so the husking hook has been developed to deal efficiently with the task of removing the husks from the ears.

On account of the climatic conditions through the greater part of the United States' maize-growing sections favouring slow drying of the harvested maize in the winter months, a great deal of the maize is husked out in the field at harvest. This harvesting method is also followed in this State in such districts as the Tableland, the South Coast, and South-western Slopes (Tumut and Gundagai). On our North Coast, on the other hand, maize is usually harvested and stored in the husk, and husked out later by hand or with husking and shelling machines. It is particularly in this method of harvesting (husking out of the standing stalks) that the records have been made with hook huskers, though they should also be of value in husking from the barn on the North Coast. Peg huskers are most largely used at present in New South Wales, but the great superiority of the husking hooks, and the fact that some of these hook devices have been seen in action in the hands of maize growers in this State, and are now obtainable locally, suggests a timely description of some of the features here.

The great advantage of the husking hook over the husking peg, apart from the greater speed possible, lies, so the users say, in the avoidance of the severe strain on the wrist. Men have been seen suffering from badly swollen wrists and strain, as a consequence of continued husking with the peg. The husking hook considerably relieves this strain by reason of its different action, the task of opening the husk by the hook being an arm action instead of a wrist action as with the peg. This throws the heavy strain off the

wrist and makes possible long-continued husking without injurious or disconcerting consequences. A short description of one type of hook—the thumb hook—and the method of use will be of interest.

A leather wrist band, with a strap to pass over the thumb, has riveted on it (so as to fit the ball of the thumb) a light steel shield which is prolonged into a short hook pointing back towards the wrist. The usual method of working with it is to grasp the ear near the tip with the left hand, insert the hook into the husks just opposite and just below the left hand, pulling it with the weight of the arm behind it to open the husks and expose the ear. The



A New Type of Husking Hook.

Note the short hook just below the thumb.

husk is now grasped tightly with the left hand and pulled back to force the ear into the right hand. Finally the ear is broken from the husk with a snapping motion. Those who are accustomed to peg-husking find that this different method of operating takes a little more time to acquire properly, but if commenced slowly to get the motion it is soon picked up and becomes superior to the husking peg.

A modification of this method is used by some huskers in America. With the butt of the cob uppermost, the ear is grasped with the butt in the palm of the left hand and the first finger and thumb round the shank. The husks

are torn just below the middle, and without drawing the right hand away, the fingers are slipped into the opening made at the top of the cob. Then with a twisting motion with each hand in opposite directions the cob is twisted out of the husk. This modification requires a very strong grip in the left hand.

The great advantage of both these methods in the standing crop is the saving of the many motions which are required in peg-husking, and the fact that the cob is left grasped in the right hand with which it can be thrown to the point desired.

Some idea of the strides that have been made in America in speeding up the work of husking maize may be gathered from the results achieved in husking or harvesting contests which have been carried out in that country in recent years. Particulars from several American farm papers indicate that very great interest has been awakened in contests which have been held recently in several States. Thousands of farmers have gathered to witness them in Iowa, Nebraska, and Illinois, the contests being followed by a championship contest among the winners from each of these States. In these contests, each husker is given a part of the field to himself, and has a man with him to drive the waggon alongside to receive his corn. Each husker takes two rows at a time, and is followed by two gleaners with sacks picking up the good ears he has failed to husk or which have missed the waggon Two pounds of corn are deducted for each pound left on the field. The ears have to be husked reasonably clean, each husker being allowed seventy-five pieces of husk per 100 ears, and one-tenth per cent. of the weight of corn harvested is deducted for each piece of husk left on over this number.

A recent issue of the *Country Gentleman* describes the above championship contest as follows:—"A cold wind drove down from the north with scattering flakes of snow, ideal weather for corn-husking, as the six contestants—two from Nebraska, two from Illinois, and two from Iowa—lined up at the edge of a big cornfield, near the village of Alleman, Iowa. In this field, the average yield of corn was about 50 bushels to the acre; but after it ripened, a heavy north wind and rain had blown down a lot of it, and the huskers had to stoop often to get an ear close to the ground. This prevented them making any big records."

The championship was won by F. Staulk, who, in one and a half hours, had 1,891 lb. of ear corn in his waggon. He left 20·8 lb of corn behind him unhusked or on the ground, and his corn had 151 husk ribbons on it per 100 ears. After deductions were made for these according to the rules of the contest, Staulk had husked 1,705 lb. of corn, or a fraction over 24 bushels in the hour and a half. In better yielding fields of corn, records of over 200 bushels in a nine or ten-hour day are stated to have been made by some of the State champions. It is significant that most of these good rates of husking have been put up by men using husking hooks. In the above contest, Staulk used a thumb hook of the type referred to above, and most

of the other competitors used either thumb-hooks or wrist-hooks. At one stage, Staulk is reported to have been throwing husked cobs into the waggon at the rate of 58 to the minute.

In these days, when the labour cost of production (particularly of maize) must be reduced to a minimum, it seems as if the old husking peg is due to be superseded by the more efficient and more comfortable husking hooks described.

State Conference of the Agricultural Bureau.

The third annual State Conference of the Agricultural Bureau will take place at Hawkesbury College on 20th to 22nd July, and already a comprehensive business paper has been drafted. Addresses are to be given by Messrs. D. Kelly (Parkes), Lindsay Evans (Dapto), J. P. Mooney (Dumaresq Island), Colyer (Gocup), H. V. Smith (Batlow), A. G. Manning, M.P. (chairman of the Australian Meat Council), E. B. Comans (Commonwealth Clydesdale Horse Society), W. L. Waterhouse (Sydney University), A. H. E. McDonald (Chief Inspector of Agriculture), Max Henry (Chief Veterinary Surgeon), and Dr. Seddon (Director of Veterinary Research).

Invitations to attend have been accepted by representatives of farmers' organisations in Victoria, South Australia, and Queensland, and have been issued to all farming bodies, also State departments and other organisations concerned in the primary industries.

Spraying Weeds on a Banana Plantation.

"My son has a dairy farm on the Richmond River and has put in about 8 acres of bananas in the very rocky high land at the back of the block. They are greatly troubled with weeds, which it is very difficult to deal with by chipping, as they grow in the cracks of the rocks. They have been advised to spray with arsenite of soda or one of the advertised weed-killers, but I am doubtful as to the effect on the bananas. Would you be good enough to give me your opinion?"

The writer of the foregoing was informed that the practice of destroying weeds in cane-fields by spraying with a solution of sodium arsenite had been successfully used in Hawaii. In one case land was sprayed for five years for weed destruction at the rate of three applications per year, using 5 lb. arsenious acid per acre for each application. The results obtained indicate that no fear need be entertained regarding any detrimental influence on organisms upon which the plants rely for nitrogen, provided proper soil texture is maintained. It was also found that the arsenic practically lost its toxic influence towards plants.

The reply added that if it was intended to attempt weed eradication on a banana plantation the arsenical spray should be applied to the weeds only, care being taken not to spray the banana plants as well. It appeared doubtful, however, whether small amounts of fine spray falling on the stems of adult banana plants would seriously injure them.—A. A. Ramsay, Chemist.

Dairying in the Central West.

[Concluded from page 354.]

W. H. BROWN, Editor of Publications.

THE possibilities of dairying in the west and the direction in which development may most safely take place being thus before us, it is of interest to consider a little more fully the variety of conditions under which the industry is already being carried on in this part of the State and to indicate the returns that a few farmers are getting. This may best be done by briefly reporting conversations with a few of the farmers visited in company with Mr. Dalgleish in the latter part of the past summer.

Milking Cows under Varying Conditions.

As has already been stated, there is nothing very surprising about success with a herd on river flats where lucerne can strike deep through rich alluvial deposit to never-failing supplies of moisture, nor perhaps is it quite unexpected that dairy cows should have a place on farms that command irrigation water, but it is a matter of widespread interest and importance that farms that possess neither of these resources should be running herds of up to thirty cows to the entire and expressed satisfaction of the owners. It was, in fact, a circumstance of continual interest that not one of the farmers visited entertains the slightest doubt about the business being a sound one, or suggests in any way that he proposes to withdraw from it. Some of them have only a few animals, some have herds of up to thirty milkers—some have been at it for a few months only, some for nearly twenty years—some combine their dairying with other lines like wheat and sheep, or with growing lucerne hay for the market, and some few are primarily and essentially dairy-farmers—but the note of confidence and satisfaction everywhere was so marked as to be a direct encouragement to many others to follow their lead.

The extensive Lachlan flats provide hundreds—thousands, in fact—of acres of land as fine, perhaps, as any in the State. For the present these flats are chiefly occupied by sheep, their inexhaustible fertility and their underground supplies of water providing excellent grazing, be the season good or bad. It requires no prophet, however, to foresee the day when they will be put to more intensive use, and the first step in that direction is likely to be dairying. Already lucerne occupies a good many acres, some of it being grazed, and a good deal more being cut for hay, four, five, and even six times per year, and yielding 1 ton per acre and more each cut. One block was pointed out that in the past season gave 3 tons per acre at one cut—sure proof that a day of greater returns than sheep can yield is at hand for the Lachlan flats.

The grazing of dairy cows on these flats is not limited, however, to lucerne paddocks. Quite a number of farmers who combine lucerne-growing with dairying run their cows on native pastures with an occasional few hours' grazing on the lucerne, but keep the hay for sale to less fortunate owners of live stock.

On the Lachlan Flats.

A few there are who chiefly use the lucerne for their own purposes. Of this class is Mr. L. J. O'Neil, who occupies a farm of about 100 acres of very high-class land on the Lachlan, a few miles from Forbes. With 80 acres under lucerne and 20 acres of natural pasture he runs thirty cows, utilising portion of the lucerne to extend his grazing area. The farm, which is typical of a great deal of the Lachlan country, lies in a bend of the river and is so well watered from below that the irrigation plant, which is part of its equipment, has not been in use for two or three years. A block of 30 acres of lucerne, on which the cows are usually grazed at night, carried thirty head of cattle continuously for some months last winter, and though the stand would now be regarded by Hunter and Peel river growers as rather thin, it will still yield good grazing for some years, providing it is a little more leniently treated. This particular stand has been down four or five years and is about the oldest on the farm. Later plantings are nearer to the river, and it is one of the younger blocks on this farm that yielded the 3 tons of hay per acre at one cut, to which reference was made above. Several stacks of hay are to be seen on the farm, and reserves of fodder having pretty well reached maximum probable requirements, this farmer may be expected soon to join the ranks of those who grow lucerne for sale as hay.

The cows themselves, though only an ordinary dairy herd, would not have looked as well on the coast. Some sixteen animals gave 25 to 30 gallons at each milking in the spring, and late in the summer they were still giving 15 gallons per milking, though they had been milking rather long owing to there having been trouble with the bull. Mr. O'Neil said his biggest cheque was about £40 (he had forgotten the exact figure), but he had had £32 per month for sixteen cows several times, the price of 1s. 3d. to 1s. 5d. per lb. for butter-fat having helped to swell the money.

A few miles away we found Mr. A. W. Marshall, also on river-flat country, but as yet with only a few acres of lucerne. His farm of 123 acres is divided into four paddocks, but these are to be further divided as soon as possible. "The nearer you have your dairy- arm to a draught board the better," he said. Some of this farm has been cultivated, and the feed is of fine quality, as is suggested by the fact that twenty-four cows were on the place late in the summer, and Mr. Marshall looks forward to increasing the herd until he is milking thirty, with dry cows extra. On a nice bit of river flat on which irrigation should hardly be necessary, the drift being near enough to the surface, a couple of small blocks of lucerne have been sown and have made a very promising start. This, together with another few acres of lucerne, and say, 10 acres of oats for hay each year, will afford ample security against dry

spells on the pastures. Mr. Marshall is quite clear that operations are most profitable in winter, feed being most abundant then and prices for milk and butter at highest.

With an appreciation for modern methods, this farmer has equipped his milking shed with a small two-bucket milking plant. The bucket plant commends itself to him as most easily kept clean, but he prefers to change the bucket

Lucerne on the Lachlan Flats.
The block in the background yielded 3 tons per acre at one cut.

frequently during milking. For the most part his product is disposed of as milk in the town of Forbes, but his confidence that dairying must develop as an industry in the west, and that above all the winter months are the best for the purpose, give him a special claim for inclusion in our little list

Baling Hay on Lachlan Flats.
Modern machinery at work in the field.

"In this country a man is safe with thirty cows and 20 acres of lucerne," said Mr. Ford, another farmer with a long experience in the Forbes district. At present he is managing a dairy farm near the town with twenty-eight milkers, though he has had over forty. He also has natural pasture, but supplemented by lucerne for which the irrigation plant is seldom required.

Near at hand, we came upon a derrick press operating in a paddock as shown in the accompanying illustration. With two men's labour, the horse-drawn power-driven press was putting up lucerne hay in 80-lb. bales at the rate of about 150 bales per day. This farmer is a lucerne grower, catering for a local market—when other feed is scarce, and running no cows himself. But his plant may be accepted as indicative of the new day in live stock management in the central west.

In the Vicinity of Parkes.

Though at Parkes the Lachlan river with its wide flats is miles away, it is a mistake to suppose, as some do, that lucerne will not grow. Quite apart from creeks that furnish conditions a good deal resembling on a small scale the river flats at Forbes, evidence is accumulating that lucerne will grow on the red soils. When that conviction comes to be translated into practice in this district, dairying will be pursued by farmers who scout the notion at the present time.

Quite close to the town of Parkes, with quite a good creek running through it is the 260-acre farm of Mr. F. Brady. With nice grazing paddocks and a certain amount of cultivation, security is afforded a dairy herd of over forty cows by a few acres of lucerne on flats near the creek, in addition to smaller areas of fodder crops on other parts of the farm. The lucerne had only been sown nine or ten months before our visit, but it had already been cut twice, and a third cut was nearly ready at the time, while one more at least would follow before winter. Underground soakage on this flat also enables excellent maize, potatoes, and vegetables to be grown. That the winter is a season of plenty of feed is fully appreciated, whereas a possible summer shortage requires to be anticipated, and in addition to the lucerne, wheaten hay is grown, though the value of oaten hay as a maker of cream, if the crop is allowed to get a bit in the dry side, tempts Mr. Brady in that direction. In his case we have a dairy-farmer with a recognition that fodder cropping on a small scale is essential to success, and when it is remembered that his conditions are not so very dissimilar from those of a good many farmers in that part of the west, his confidence may well be an assurance to others that there is something in it for them.

Dairying on Wheat Country.

No doubt the reply with many will be an undue amount of emphasis on the four or five acres of lucerne on the bank of the creek, but to these our rejoinder is the experience and successful methods of a wheat-farmer who has no river or creek flats, but who yet grows lucerne without irrigation on what may be termed "dry country." We have in mind Mr. S. J. Donaldson, of Goobang, 8 or 9 miles north of Parkes, a wheat-grower with a considerable area who also grows oats, runs a few sheep for the fallows and stubbles, and usually has forty to fifty cows, being the largest supplier to the Parkes factory. Essentially a wheat-farmer, Mr. Donaldson practically grows all his wheat on fallowed land, and follows each wheat crop with one of oats, with the double object of controlling diseases and of providing himself with oaten hay, oaten straw, and even oaten silage for his live stock. The natural pasture is

surest, of course, in the winter, but good summer grasses such as windmill and corkscrew grasses are usually available. Periods of scarcity come, however, and then the stacks of hay and straw, and the silage have to be resorted to. The straw will keep the animals alive, of course, but it is no good as a milk-producer. Silage, on the other hand, is found to be an

Grazing Cattle on Lucerne near Forbes.
Part of Mr. J. O'Neil's herd.

excellent thing for producing milk, though the herd must be managed with judgment while on it. Mr. Donaldson finds it keeps the cows in milk longer than usual. In the last very dry year, silage kept the cows in milk for nearly twelve months, but they got too low and went down in calving. That year, the cows averaged about £16 10s. per head for the year, but it

Reserves of Fodder near Parkes.]
Stacks of oaten hay on Mr. S. J. Donaldson's farm.

was a bit too much for them, and such prolonged milking will never be repeated, though the experience by no means discounted silage in Mr. Donaldson's mind, for he has now about 350 tons in the pits again.

A block of 11 acres of lucerne has a valued place on the farm. Without underground irrigation or any artificial application of water, it yields nice crops of hay for storage in good seasons, and invaluable grazing in bad

seasons when feed is scarce elsewhere. Though seven or eight years old, it is still a good stand, no w t standing that in one or two dry years it has received somewhat harsh treatment. Mr. Donaldson made the interesting remark that the lucerne seemed to show the effects of grazing more in the years following the drought than at the time. Seeds of weeds and grasses seem to be blown on to the ground and to germinate with rain, crowding out the lucerne by their rapid growth. He believed that if the stand received a little special care the year following the drought, the lucerne would beat the weeds and get established again. The idea of top-dressing with 50 or 60 lb. of superphosphate per acre the following spring might also be considered in such a case.

The cattle must necessarily be turned on when the green lucerne is dry, or trouble will occur with bloat, and it is found that some discretion is required in working sheep and cattle together in a dry spell. Water, needless to say, is an essential, and it should be near the stored feed if possible.

With all these reservations and cares, however, this farmer, having run the dairy for years as a side-line to wheat-growing, has no thought of giving it up. On the contrary, the milking cows are regarded as a valuable feature of the farm. The herd, by the way, is a mixed one. At one time, pure-bred Jerseys were kept, but they were regarded as somewhat delicate for the conditions, and now Milking Shorthorns have taken their place, though a liking for a little Ayrshire blood is admitted.

The Lachlan and the Macquarie.

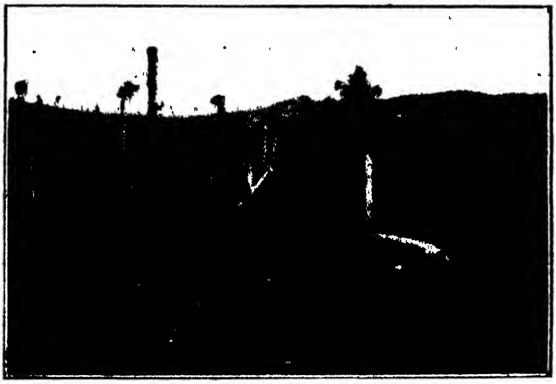
While in a general way, the country around Dubbo and Wellington strongly resembles that about Parkes and Forbes, the differences between the Lachlan and the Macquarie River banks are considerable. The Lachlan is marked by wide fertile flats that are tempting an increasing number of men into intensive farming, who thus are, of themselves, bringing about smaller holdings. The Macquarie, on the other hand, winds a tortuous course between high banks, only in a few cases, such as around South Dubbo, offering fertile, sub-irrigated flats for the lucerne-grower. The soil conditions vary markedly, and schemes for artificial irrigation have to take into consideration the suitability of the soil and subsoil. Areas of fertile soil underlaid by stiff, retentive subsoil that holds the moisture within reach of the crops are sought for on this river, and a number of pumping plants that lift the water from the river as much as 30 feet and more above water-level are to be seen.

The majority of farmers on the river are less fortunate, however, and are content to regard it as an assurance that they will not run out of water in dry times. Consequently the dairy-farmer, as such, while met with on the Lachlan, hardly exists on the Macquarie, dairying there being more usually associated with wheat-growing.

Wheat and Cream on the Macquarie.

Mr. J. Godwin, on the Talbragar side of Dubbo, but below the confluence of that river with the Macquarie, milks twenty-five good-looking Jerseys on a farm of 300 acres, of which about 100 acres are annually cropped for

wheat. He has had his "ups and downs" in the matter of drought, and as he does little in the way of conserving fodder, has known what it is to "wrastle through," but his Jerseys (making quite the best herd seen on the trip) are much more to him than mere "cattle," and at the same time are an essential and profitable part of the farm operations. No lucerne is grown, only a little oaten hay is made from time to time "for the horses," and the cows freshen at all times in the year, so that the best cheque for 1924 (£32) was received for December, when butter-fat was only bringing in 10½d.—a time of the year when production should be "tailing-off" on a western dairy-farm. His biggest cheque of all was £61 in a season when butter-fat was at 1s. 2d. and 1s. 3d. per lb., owing to coastal drought. "It's wonderful what you can do on grass when there is plenty of it," he said. Though he has no lucerne himself, a farmer on the opposite side of the river has several acres that crop well without any irrigation—additional evidence that the "king of fodders" has yet to be fully appreciated in these parts.



A Commonplace but Profitable Feature of Dairying.
Western farmers might well give greater attention to pigs.

A good deal of the success of this property, perhaps, depends on a couple of nice paddocks toward the river, which give good feed and shelter; but another factor of some importance is the care taken that there shall be no shortage of water. With this, and the sweet concentrated feed that the dry pastures afford even in a drought, the absence of rain has to be very prolonged before feed has to be bought or agistment has to be sought.

A few miles away Messrs. Burge Brothers with 1,400 acres, annually crop 400 acres and usually graze 500 to 600 sheep. They have, too, a fine block of 30 acres of lucerne which yields hay worth up to £1,200 a year, and though their interests thus appear to be on a considerable scale, they run a small milking herd whose history in itself is evidence of the value the owners attach to dairying. Originally the herd was over thirty strong, and during the year 1923 an average of twenty-five cows earned cheques totalling £365 for butter-fat, but in the two dry seasons through which the Dubbo district has recently passed the herd became much reduced. On the return of better

feed, dairying was resumed, and to-day seventeen cows are contributing to the returns. Messrs. Burge Brothers' farming operations, it will be seen, are fairly extensive, but they have proved that mixed farming offers the greatest security and the best profits. That their experience should lead them to include dairying in the activities of such a large farm should in itself be an encouragement to men on smaller areas, where it is even more necessary that the eggs should be put in more than one basket.

The main facts regarding the farm of Mr. E. J. Bullock, of Bodangora, near Wellington, have already been given. He furnishes another example of a fairly extensive farm being made to afford room for dairy cows on the hypothesis that, provided the herd is properly managed, it is such a good thing, and fits so well into other farm operations, that he would not be without it.

Method and order are the watchwords of the farm. On the one hand it is expressed in the precise and cleanly condition of the machine-milking and power separating plant, and, on the other hand, it has its effects in the management of the herd, the cows freshening in the autumn when feed is becoming more plentiful, and drying off in the summer when feed is becoming scarce and other parts of the farm programme demand more attention.

Though there is no lucerne on the farm there are quite profitable stands close at hand—ample encouragement for anyone who contemplated dairying to prepare and sow a few acres. With this, and with the high feeding quality of the grasses, a herd could be run with security. In the 1920 drought, Mr. Bullock did not spend £10 on such feeds as bran, but he milked the cows right through.

From several of these farmers there came the testimony that it is quite easy to keep cream sweet even in the heat. If the can is stood in shallow water with a bag over it the high evaporation will keep the cream cool, though the bag should be changed at intervals lest it gets musty. The only trouble in this connection is due to carelessness in handling the cream, and to mixing "hot" cream with "cold."

Pigs as Contributors to Profits.

On several of the farms visited pigs were found to have a useful place, but it was evident that a number of farmers do not realise their value, especially as combined with dairying. As a means of turning the skim-milk to account, particularly where lucerne is grown, no dairy-farmer can afford to be without them. Their housing and their feeding cost next to nothing, but as 100 to 135 lb. baconers, grown in hardly more than a few weeks, and involving little handling, they are most profitable. All that is required is a little watchfulness in their growth, so that good sound flesh is produced—for poor pork will never make good bacon. The opportunity the factories afford of cheap butter-milk (hardly less fattening than skim-milk), might well attract the attention of a few small farmers near at hand.

Conclusion.

It is not claimed for the farms of which we have given brief accounts in the foregoing pages that they are the best on which dairying has a place in

the central west. There are many other men engaged in the industry, and perhaps some who are operating on larger lines, or even on better ones in certain respects, but these few have been selected as showing that dairying is being conducted with profit under a variety of conditions and methods, and that the business is good enough to encourage extension on to a good many other properties. It might even be said that there is hardly a set of farm circumstances in that part of the State where a few cows could not be handled with advantage—that is to say, with direct profit for the owner and with good effect in relation to the rest of the enterprise. Mixed farming on a wider basis even than wheat and sheep is advisable—perhaps even necessary—for the smaller properties, and the first answer lies here.

As experience accumulates, greater attention will be given to the conservati o fodder, and along with that will come the practice of having most of the cows dry when feed is scarcest. Beyond these two necessary develo ments lie other roads, the signposts to which read "Individual Testing" and "Pasture Improvement." When more closely examined, the going there will be found quite good.

Clean Milk Competitions.

Clean milk competitions are a somewhat recent development of dairy life in England. The competitions appear to last for some time, for the custom is for the competing farmers to take routine samples of their milk at intervals and to dispatch them at regular intervals to the laboratory; but the county inspector, who usually acts a judge, makes surprise visits and take samples for himself. These samples are tested for keeping quality, number of bacteria present, and degree of contamination by fæcal matter, while the butter-fat and visible dirt are also frequently ascertained. The animals, sheds, dairy, and methods of each competitor are examined and score-carded, and the inspector is frequently able to give a bit of instruction or to offer a hint as to some portion of the dairy, as well as to point continually to the value of thorough cleanliness.

Originally the custom was to publish a short report at the end of the competition, but it was found that competitors had a very keen interest in knowing how they were getting on, and the practice has been adopted of sending out interim reports at stages at which all competitors have submitted an equal number of samples for analysis. The reports give notes on the analyses and on the surprise inspections. No names are mentioned, but the code numbers (known only to the organisers and each competitor) are given, so that each farmer can pick out his own results. These reports are very carefully studied, all are enabled to profit by suggestions (and at the same stage in the competition), and much important information is disseminated.

The effect of the competitions has been a marked decline in the number of bacteria present in the samples from competitors, and a distinct increase in the period over which the samples of milk will keep sweet.

If the competitions have the same general influence upon dairy practice as crop competitions have had upon wheat-growing in some districts of New South Wales they will be valuable indeed.

Onion Trials on the Lower North Coast.

J. M. PITT, H.D.A., Senior Agricultural Instructor.

Two onion trials were conducted during 1924 by the Department in co-operation with farmers—one with Mr. R. Dyball, Taree Estate, which, like a number of onion plots sown early or at the usual time, proved a failure; and the other with Mr. F. Waters, East Kempsey, which was sown later and proved a very good plot.

After July, when the plants at Taree Estate were put in their permanent bed, the season was not a suitable one for onions. The cold early spring weather in August and September was responsible for the appearance of mildew, and as this period was also somewhat dry the crops planted at the usual time failed altogether. The plants at Kempsey were not put in the permanent bed until September, and although the outlook for the first three or four weeks was not promising, the heat of the drought, late in October, brought the crop on wonderfully well and excellent yields were harvested. Onions are not grown to any extent on the Macleay, and Mr. Waters had no difficulty in disposing of the crop.

The seed was sown late in April. The bed to which the plants were transferred in September was composed of rich alluvial soil. The plants were placed 6 inches apart in rows 18 inches apart.

Some of the bulbs, namely, those of Odourless, Light Brown Spanish, Ailsa Craig, Long Keeping Brown Spanish, and Market Model, were of excellent quality, those of the Odourless variety averaging from 4 to 6 inches across. Owing to their mild flavour they were readily disposed of first. Although the white-skinned varieties gave the heaviest returns, they were not good keeping varieties. Early Barlitta comes early and can be disposed of from about the eschalot size onwards. Late White Tripoli was very uneven in shape; in many instances the bulbs grew in clumps of two, three, and even four. Odourless, although an excellent eater, is not a good keeper, becoming soft if kept too long. It is a very desirable onion, however, for household use, being quite in a class by itself as regards mild eating quality. Light Skinned Brown Spanish is a very attractive onion, clean skinned and a good keeper.

Following were the yields per acre:—

	t.	cwt.	qr.
Early Barlitta	15	0	2
Late White Italian Tripoli...	15	0	0
Odourless	12	0	0
Ailsa Craig	11	9	3
Light Skinned Brown Spanish	9	2	2
Prizetaker	8	5	0
Market Model	7	1	3
Long Keeping Brown Spanish	6	15	2

Fumigation of Citrus Trees.

Notes on Recent Developments in California.

D. B. FERGUSON, Assistant Orchardist, Hawkesbury Agricultural College.*

Of the methods of controlling scale insects on citrus trees, fumigation is generally recognised to be the most effective. Fumigation for this purpose was introduced into New South Wales by the Department of Agriculture in 1899, and as far as the use of potassium cyanide is concerned no departure has been made from the pot method of application. Any method, however, which makes for greater efficiency or saving of time is worthy of consideration. The following article will give an idea of the treatment adopted in California, and also afford a few suggestions which might be put into practice in this State.

Many of the citrus ranches in California are conducted by companies, the area of whose holdings frequently runs up to 1,000 acres, and these organisations can well afford to invest a considerable amount of capital in an efficient fumigating outfit. Smaller ranches are often fumigated by contract, but the majority of growers who consider their area insufficient to warrant the purchase of an outfit, rely upon the various co-operative organisations to which they belong. Unfortunately there are no contractors operating on a modern basis in New South Wales., and probably the best way out of the difficulty would be for the citrus packing-houses or such other community concerns as branches of the Agricultural Bureau, to take over the work in districts where they exist.

Liquid Hydrocyanic Acid.

Although this acid has been known to the chemist for years, it has only been used for fumigating purposes since 1917. At the present time it is manufactured largely on a commercial scale, and in California has almost entirely taken the place of pot and machine generators, with the exception of the "cynofumer," to which reference will be made later. Liquid

* The author of this article spent over two years in California, working in different packing-houses and orchards to gain experience. For portion of this period he was engaged as foreman to a fumigating gang working on the most up-to-date lines.

It might be mentioned that when the first reports of the successful use of liquid hydrocyanic acid for fumigation of citrus trees were received by this Department from the United States, one of the leading manufacturing chemists in Sydney was approached as to whether supplies were likely to be available in New South Wales, but the opinion was expressed that the demand would be too small to warrant manufacture, which in any case was attended by dangers that they would not care to incur (see *Agricultural Gazette*, Nov., 1921, p. 827). Since that date a supply of anhydrous liquid hydrocyanic acid (which is a more recent development and which it is claimed can be transported with safety) has been obtained from manufacturers in South Africa.

A report on some experiments with calcium cyanide dust fumigation was published in this *Gazette*, September, 1924, p. 664.—Ed.

hydrocyanic acid is a colourless fluid less than three-quarters the weight of water. It is also very volatile, and boils at a temperature of 80 degrees Fah. For this reason it is necessary, when using the acid in the field, to keep the drums in a shady place and covered with wet bags. Because of its high volatility a gas is rapidly given off when the liquid acid is exposed to the air. This gas is of a highly dangerous nature, making the acid a commodity which shipping companies will not undertake to transport. Its use for fumigation, however, has many outstanding advantages, in that the method is more simple, the necessary apparatus is much less cumbersome, time and labour are saved, and the results are more even.

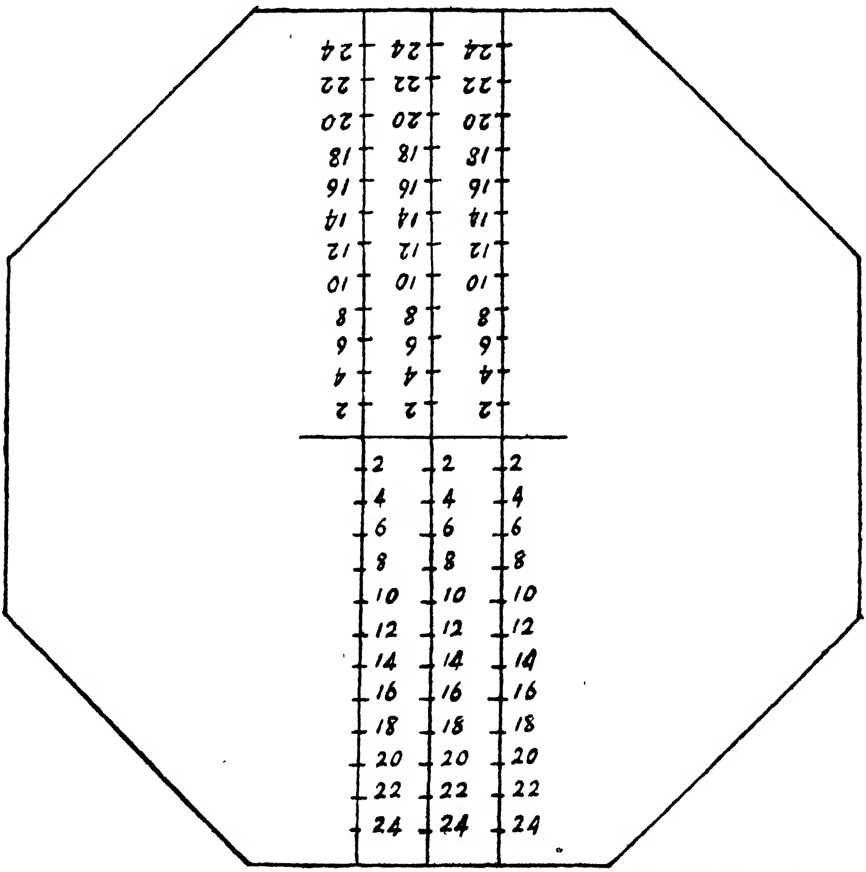


Fig. 1.—Fumigation Sheet with Graduations by which the Measure over the Tree is ascertained.

The Equipment.

Sheets.—Sheets of octagonal shape, varying in size up to 80 feet in diameter, are used for tenting. Seedling groves necessitate the use of large sheets, but worked trees seldom require sheets measuring more than 50 feet

across. The material from which the sheets are made is a heavy 8 oz. duck. When purchasing sheets it is essential to consider the size of the trees. A tree 10 feet high will require a 40-feet sheet, while those from 11 feet to 15 feet high will need sheets 45 feet to 50 feet in diameter. The above sizes will cover most trees in groves where Washington Navel, and Valencia are grown. The corners to which the poles are attached should be reinforced by a double thickness of material. From fifty to sixty sheets are used where a six-man crew is operating. The tents are marked from centre to edge as in Fig. 1.

Poles.—The poles for use with 45-feet or 50-feet sheets are 14 feet in length. Valencia trees are inclined to grow taller than Navels, and will probably require 16-feet poles. These poles must be of a straight-grained, light timber, and oregon is often used. They are 2¼ inches by 2½ inches (the corners rounded off), and pointed at one end. At about 6 inches from the opposite end a ¾-inch rope is attached. The rope should be at least 4 feet longer than the pole.

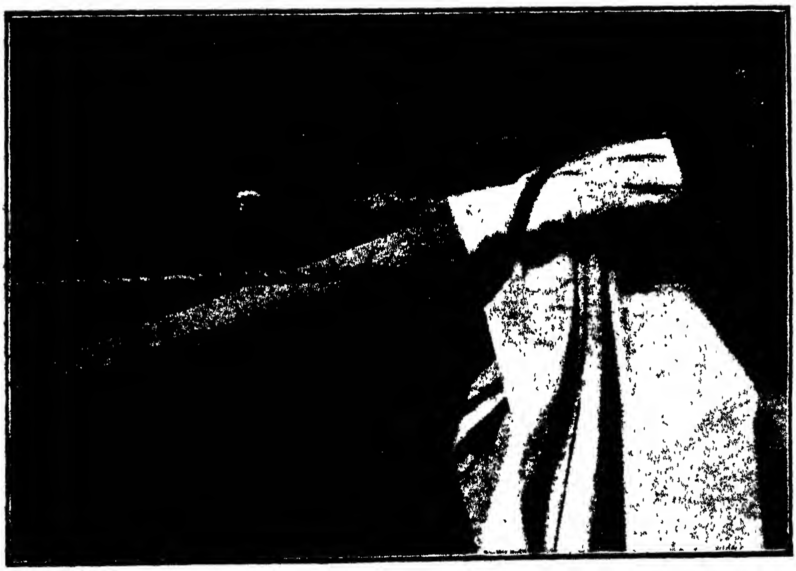


Fig. 2.—Method of Attaching Sheet to the Hoisting Pole.

The Atomising Machine.—This is the device for spraying the acid under the covered tree. It consists of a tank to hold 2 gallons of fluid acid, a pump by which the dose is discharged, and a spray nozzle.

The only other appliance necessary is a ¼-inch rope about 60 feet in length marked off in feet (referred to later as "the tape"), a small acetylene lamp which can be attached to the belt of the dosage measurer, and a dosage table.

The Crew.

Where fumigation is being conducted on a large scale the crew should consist of six men. In order to make clear the working of the gang, in this article they will be numbered as follows:—

No. 1, the foreman, whose duty it is to determine when the weather is suitable for fumigation, and to see that operations are suspended when temperatures become unfavourable or other adverse weather conditions arise.

No. 2, commonly known as the gunman, who carries the atomising machine and liberates the gas under the tented tree.

Nos. 3, 4, 5, and 6, who take turns at pulling and tucking the sheets.

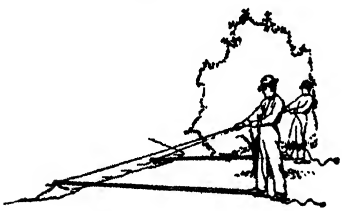


Fig. 3.

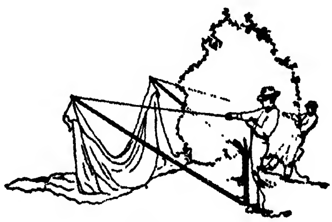


Fig. 4.

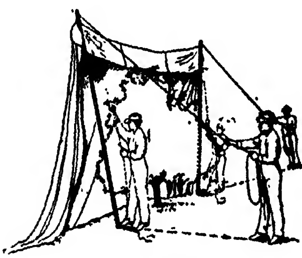


Fig. 5.

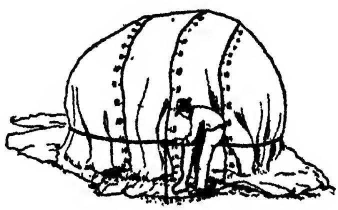


Fig. 6.

Successive Stages in placing a Sheet over a Tree with Poles.

The Crew at Work.

For the sake of illustration we will assume that there are sixty sheets in use, and that there are sixty trees to the row. One tent is spread opposite each tree in the first row. Nos. 3 and 4 take their poles and commence covering the trees beside which the tents are placed, and Nos. 5 and 6 follow immediately behind and tuck the bottoms of the tents in. Pulling tents is strenuous work, and after thirty have been pulled Nos. 3 and 4 will change places with Nos. 5 and 6 for the remainder of that row. When the first three or four tents have been pulled, No. 1 commences measuring the covered trees and calls the estimated number of ounces to No. 2. The latter, with the liquid acid in the atomising machine, follows No. 1 and liberates the required dosage beneath the tree.

The time necessary for the tent to remain on the tree is 45 minutes, and a good crew usually manages to complete one row in from 35 to 40 minutes; thus they have from five to ten minutes rest before commencing the next row. After the first row is covered the tents are pulled directly off one tree on to the next. It may be mentioned here that much more energy is required to pull a tent off the ground on to a tree than off one tree on to the next.

Tents, especially after several months' use, are easily torn, and will require repairing frequently. A sewing machine of a strong make is used for this purpose. No trouble is experienced in finding the large tears, but the small holes are not so easily detected. These holes will reveal themselves if the repairer gets underneath the tent, placing it between himself and the light.

The Procedure in Detail.

Covering the Tree.—Poles one foot longer than the height of the trees are required; that is to say, if the tallest trees in the grove are 15 feet in height, poles 16 feet in length must be used. Two poles are used, one placed on either side of the tree, the pointed ends about in a line with the trunk and the roped end attached to the tent, as in Fig. 3. The attachment is made by placing the pole under a corner of the tent and looping the rope tightly round tent and pole, as pictured in Fig. 2. After the pole has been secured by this loop to the tent only two movements are necessary:—(1) Place the right foot on the pointed end of the pole, as in Fig. 3, and hoist the tent up (see Fig. 4) until the poles are perpendicular, as shown in Fig. 5. (2) Move to the rear, and sufficiently to one side, to prevent the upper side of the tent from sagging (see Fig. 5). From this position a final pull is made and the tent slides over the tree.

Tucking in.—Often, after being pulled, the tents are a little to one side; it is the duty of the tuckers to straighten the tent and tuck the edges in. This can best be done by one man holding the tent off the ground at one side to allow the air to pass out, while the other kicks the bottom edges under. To save time for those pulling the tents on to the next row, the corners of the tent to which the poles have to be attached should be left in a visible and convenient position by those tucking in.

Measuring the Dosage.—The required dosage is based upon the distance over the tree and the circumference at the bottom. The foreman has the tape fastened around his waist. He walks round the tree, making a mental note of the numbers printed on the tent at the point where it touches the ground. By adding these together he finds the distance over the tree. He continues to walk round until he meets the tape which is dragging behind him, the number at this point giving him the circumference (see Fig. 6). Suspended round his neck he carries a dosage table (furnished by the manufacturers of the gas or by the U.S. Department of Agriculture), and with the distance over and around the tree in his mind the required number of ounces of gas is quickly ascertained.

Influence of Weather Conditions.

Time.—It has been found extremely unsafe to fumigate on bright sunny days, and for this reason practically all fumigation is conducted at night. It is safe to commence operations when the rays of the sun have ceased to shine directly on the covered tree. Growers who prefer to work by daylight can do so with safety on days when the sky is heavily clouded, if the trees are healthy and not debilitated by droughty conditions or scale infestation.

Temperature.—The maximum temperature varies about 10 degrees. In hot, dry districts it is safe to commence operations at temperatures varying from 75 to 80 degrees Fah., whereas in coastal districts or mountain slopes fumigation at temperatures over 70 degrees may result in serious injury.

The minimum temperature also varies. Defoliation has been experienced where operations have continued at temperatures below 40 degrees Fah., and poor kills have been observed in the upper portions of the trees fumigated at this temperature, the reason being that the gas does not rise satisfactorily at less than 50 degrees Fah. Growers, however, seem to differ in opinion as to this matter. Some will discontinue at 50 degrees, while others will continue operating until the temperature drops to 45 degrees, and some as low as 40 degrees.

Wind.—Wind of any description is unfavourable, but as there are so few ideal nights in some districts a slight breeze is often disregarded. Anything stronger than a light breeze will drive the gas to the lee side of the tent, resulting in a poor kill on the windward side of the tree and possibly injury on the other.

Moisture.—Although humid weather conditions at the time of fumigation are not directly injurious to the trees, much damage may result. When atmospheric moisture is sufficiently high the sheets become damp and heavy, making covering operations extremely difficult. Wet sheets also collect a great deal of sand, which often cuts the surface of the fruit and foliage as the tent slides over the tree. Fruit damaged in this manner will be subject to further injury from the fumes.

"Spot" Fumigation.

Two or three months after the main fumigation, outbreaks of scale insects are often detected in various parts of the grove. In the case of red scale especially these small colonies should receive treatment as soon as possible. If these isolated trees were to remain untreated the scale would rapidly spread throughout the grove and a second fumigation might be necessary within six months; in any case the trees thus early-infested would be in such a weak condition that fumigation twelve months later would be dangerous. The spreading of scale is checked as far as possible by individual treatment of the badly-infested trees. This procedure is known as "spot" fumigation. An inspection is made from time to time, and the trees which are to receive special treatment are marked. As this work is not of a straightforward nature, cloudy days are often selected, it being much easier

to find the scattered trees in the daylight. Usually there is a considerable amount of tent-moving to be done, and a small crew of three men operating ten or fifteen tents has been found very convenient for the job.

The Best Time for Fumigation.

The most effective period for fumigation is when the young scale has just hatched out—in New South Wales in February and March. Young foliage will not withstand a heavy charge of gas without injury, and for this reason fumigation should not be practised during the spring and early summer unless absolutely necessary, in which case a lighter dosage must be used.

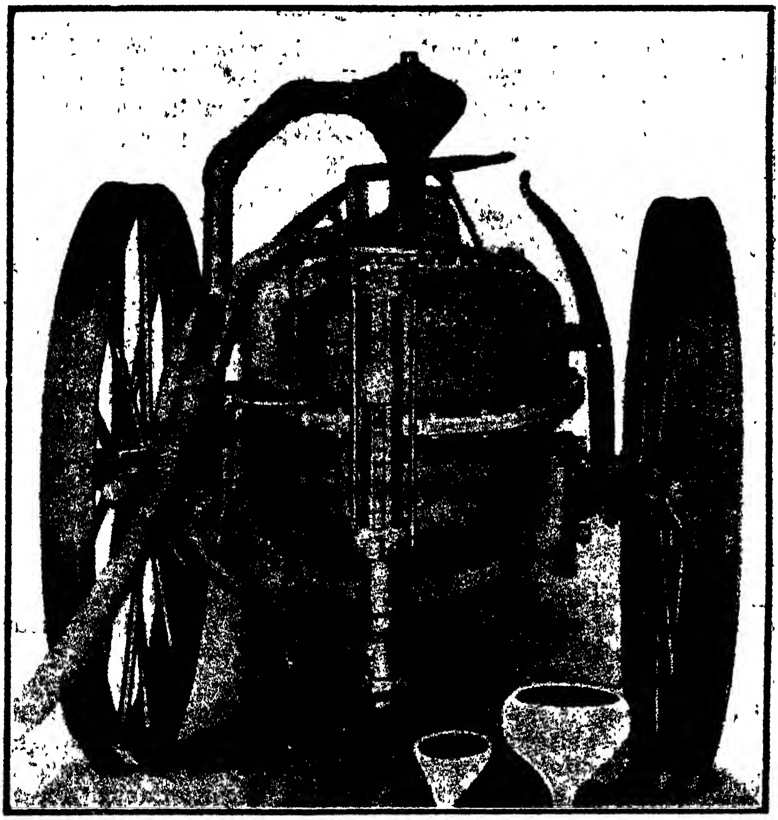


Fig. 7.—An approved pattern of Gas Generator of a up-to-date type.

Use of a Fumigating Machine.

Although during the past five years the use of liquid hydrocyanic acid has largely superseded other methods in California, good results have been obtained by use of the cynofumen, a gas generating machine (see Fig. 7). In view of the fact that liquid hydrocyanic acid is at present unprocurable in New South Wales, this machine suggests itself as a suitable apparatus for

the application of hydrocyanic fumes by the local grower. The procedure as to manipulation of the tents and so on will, of course, be similar to that described above.

The machine consists of a tank into which the specified quantities of sodium cyanide and sulphuric acid are poured; at the rear is a pump which can be regulated to discharge any required quantity of the gas generated. The apparatus is somewhat cumbersome, and a little time is lost in dissolving the cyanide and charging, but prior to the introduction of liquid hydrocyanic acid its use in California had almost entirely taken the place of other methods of fumigation.

Cost of Fumigation.

Owing to the difference in size of the trees in various groves it is difficult to state exactly the cost of fumigation. Estimates of Californian companies, however, covering material, labour, depreciation of outfit, and interest on capital invested, have given it as from 40 to 50 cents or 1s. 8d. to 2s. 1d. per tree.

The crew is usually paid on a contract basis. The foreman receives one penny per tree and the remaining five hands are paid at the rate of three farthings each per tree. A good crew will fumigate in the vicinity of 600 trees per night during favourable weather; thus, at the above rates each member of the crew would earn approximately £2 per night. To avoid operations being continued during unfavourable weather conditions, many companies pay their foremen a retaining wage of 30 cents per hour for time during which fumigation is suspended on account of the weather.

Water for Dairy Cows.

A trial conducted at Holmes Farm, Scotland, emphasises the need of a plenteous supply of water for dairy cows, and shows that their requirements in this connection are even greater than is generally supposed.

Four cows were used in a trial which started on 14th February, 1924, and continued for ninety days. The cows were on a ration of silage, hay, straw, and concentrates, while two of the cows also received turnips during part of the time. In front of each cow was a drinking cup so that the animals had access to water at all times, the water for each cup going through a meter so that a record could be obtained of the amount consumed.

The cows produced in total 6,007 lb. of milk and consumed 33,050 lb. of water, or on the average (taking a gallon as ten pounds in the case of both milk and water) 5·5 gallons of water per gallon of milk produced. The cows varied greatly in their individual requirements and in their consumption from day to day. It is apparent, however, writes A. C. McCandlish in the Scottish departmental *Journal*, that the water requirements of milk-producing cows are large, and unless these requirements are met, maximum production cannot be sustained.

The Wonderful Organisation of the Hive.

W. A. GOODACRE, Senior Apiary Instructor.

A CLOSE study of bees reveals a multitude of interesting facts, and the closer the study the more wonderful it all appears, but there is nothing which impresses the ordinary observer more than their remarkable instinct for organisation. Considering the number of bees in the hive—probably forty thousand of them—and the numerous duties, large and small, which have to be performed, the functioning under normal conditions of this army of workers appeals to one as almost perfect.

How the bees direct their large working force is, of course, somewhat of a mystery. We can understand that the young bees, when they first emerge from their cells, would for the time being take on nurse work, such as the preparation of food and feeding of the larvae, and other light home duties. Then at the next stage they would gather pollen (the lighter load from the field) and later on nectar—the heavier work. Of course there are numerous other duties, but we are for the moment considering the probability of the age of the bees having some connection with the distribution of work. It is quite evident that, under normal conditions and with regular forces of young bees emerging, the work of the colony is facilitated by bees of certain age doing work for which they are best suited. The colony, however, does not rely entirely on this principle, for we can remove a queen from the hive for a time and have no young bees emerging over a fair period, and on the return of the queen and the energetic resumption of work by the colony, the organisation does not appear to be much upset.

It is often thought that the queen bee governs the colony, but such is not the case; the worker bees are the ones that hold the reins of management, and to a large extent they control even the queen's particular work. Everything done is for the future welfare of the colony, and every worker is prepared to make a sacrifice toward that end. Should the queen be failing, or not carrying out her duties as they should be carried out in the opinion of the worker bees, then for the colony welfare the bees will usually supersede her, and rear another queen in the hope of obtaining better results. The drone bees, too, are controlled by the workers. They are reared in large numbers during prosperous times when a force of them is considered necessary, but during adverse periods the worker bees usually destroy the majority of them, as it would be against the best interests of the colony to keep them, consuming large quantities of food as they do.

There is wonderful organisation when a colony is preparing to swarm—preparation of queen cells to provide a mother in the old hive when the swarm leaves, selection of the period for the issue of the swarm, and the taking in of a supply of food to cover the swarm's journey to the new home, and to give them a good start there. In many cases the bees find and prepare a new home previous to issuing pell mell from the hive.

The developments just previous to issue are very interesting to watch. A number of workers will run about buzzing and dancing. Other bees on the trail of the dancers will take up the call, and so on, until a general excitement prevails, and out goes the swarm. The queen answers the call, but she does not lead the swarm as is often supposed.

The organisation of the smaller duties about the hive is of much interest. It is not uncommon to find, perhaps, five or six bees right on the outside of the hive busily engaged in blocking up a crack between the supers, using propolis (a gum usually obtained from trees) mixed with wax for this work. How is the organisation so controlled that a few bees will separate themselves from forty thousand to carry out a small operation such as this, and on the outside of the hive? Perhaps a thousand or more bees were aware that the crack in the hive was causing some inconvenience, yet only five or six—just enough for the task—are attending to it.

A colony preparing for the winter months must properly organise its forces to obtain the best results. With the approach of cooler weather the bees contract their sphere of operations—by this clustering together they are better enabled to keep up the temperature of the hive. The brood nest is reduced, too, and the empty cells there are filled with unsealed honey, if procurable, for use as convenient during the cold weather. The bees commence to reserve their vitality by resting so that their life will be lengthened and they will be able to survive the long winter period, and be in a condition to make a good start during the following spring.

A good knowledge of bees and their work enables the apiarist to work out many problems himself. Get to know what the bees do, and one is on the right track to knowing what is to be done for them.

The Amount Earned by a Good Bull.

A GREAT many farmers consider a good pure-bred dairy bull to be an expensive luxury—an animal that is very nice to have on the farm, but only an investment for wealthy men. This is quite wrong, points out E. W. Sampson, in the *Journal* of the South African Department of Agriculture. A good bull can earn more money than cows bought for the same sum. The better bred the cow is, the higher the profit she can yield if properly handled. If the farmer were to put a good bull to his cows and gradually replace the old stock by heifers that gave better yields than their dams, his extra profits would soon more than cover the cost of the bull. But the money earned by the bull may be calculated in a more direct way than this. Suppose a farmer has thirty low-grade cows and decides to improve his herd with a pedigree bull having good milk records on both his dam's and his sire's sides. Let us suppose that the low-grade cows are worth £10 a head and that the price of the bull is £40. It is reasonable to suppose that about twelve heifers will be reared per year. The value of these heifers at calving should be at least £3 per head higher than that of their dams, and this would mean that the bull had earned £36 on his first lot of calves.

Pure Seed.

Growers Recommended by the Department.

The Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops, in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon, and (2) after a sample of the seed has been received by the Under Secretary and Director, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the prices for the seeds mentioned hereunder.

Oats :—

Algerian	Manager, Experiment Farm, Bathurst.
	Manager, Experiment Farm, Temora.
	Gollasch Bros., Pine Park, Milbrulong.
	F. Rose, junr., "Rosemount," Cunningar.
	E. J. Allen, Gregra.
Banner	A. Wallace, Jindabyne, via Cooma.
Lachlan	E. J. Allen, Gregra.
	W. V. Herbert, "Bongalong," Muttama.
Mulga	C. E. Prell, "Gundowringa," Crookwell.
	Manager, Experiment Farm, Temora.
	Gollasch Bros., Pine Park, Milbrulong.
Myall	C. E Prell, "Gundowringa," Crookwell.
Sunrise	J. W. Eade, Eade Vale, Euchareena.
	C. E. Prell, "Gundowringa," Crookwell.
Tasmanian White	A. Wallace, Jindabyne, via Cooma.
Yarran	C. E. Prell, "Gundowringa," Crookwell.

Barley :—

Cape	Manager, Experiment Farm, Bathurst.

Potatoes :—

Batlow Redsnooth	E. M. Herring, "Sheen," Batlow.
Coronation	E. M. Herring, "Sheen," Batlow.
Early Manhattan	K. Bowen, Springside, via Orange.
Factor	K. Bowen, Springside, via Orange.
Langworthy	K. Bowen, Springside, via Orange.
Surprise	K. Bowen, Springside, via Orange.
Symington	K. Bowen, Springside, via Orange.

Grasses :—

Phalaris bulbosa	Col. H. F. White, "Baldblair," Guyra.
	Manager, Experiment Farm, Glen Innes.
Hooker's Fescue	Manager, Experiment Farm, Glen Innes.
Tall Oat	Manager, Experiment Farm, Glen Innes.

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

IMPORTS AND EXPORTS OF FRUIT.

THE following table, compiled by the Government Statistician, shows the imports and exports of fruit—fresh, dried, and processed—during the quarter ended 31st March, 1925:—

Description.	Imports.	Exports.
Interstate.	Cases.	Cases.
Fresh Fruit ...	560,414	116,443
Tomatoes ...	1,741	...
	doz.	doz.
Melons ...	... ..	120
	lb.	lb.
Canned Fruit ..	9,492	336
Dried Fruit—		
Unspecified ...	2,044	...
Currants .	3,192	56
Raisins .	3,696	56
Apricots ..	224	...
Apples ...	616	...
Prunes ..	364	..
Pears	644	...
Sultanas ...	224	...
Peaches ..	924	...

Description.	Country of Origin.	Imports.	Exports.
Oversea.			
Fresh Fruit—		Centals.	Centals.
Citrus	... .	2,807	4,575
Apples ..	....	...	4,395
Pears	....	...	1,229
Pineapples ...	.. ..	...	1,000
Bananas ...	... .	806	2
Other	....	54	1,354
Dried Fruit—			
Apples, Pears, Peaches, &c..	U.S.A.	lb. 4,200	lb. ...
Apples ..	....	...	293
Apricots ...	....	...	177
Currants	... .	...	2,266
Prunes ...	U.S.A.	20,214	736
	France	228	...
Peaches ..	....	...	100
Raisins—			
Sultanas .	....	...	98,668
Lexias ...	. ...		36
Other ..	U S.A.	1,263	210
	Syria	18	...
	Spain	1,600	...
Dates	Mesopotamia . .	96,053	43,898
Other	United Kingdom	270	5,527
	Asia Minor ..	26,756	..
	China	3,272	...
	France	114	..
	Japan	289	...
	Turkey .. .	5,835	..
	U S.A.	6,240	.
Preserved in liquid—			
Apricots ...	. . . .	...	19,595
Peaches ...	.. ..	..	14,198
Pears ..	....	...	7,372
Pineapples ..	....	..	15,344
Raspberry Pulp	.. ..	.	8,430
Other .	... ...		22,057

SCIENCE AND THE FARMER.

ONE often hears from a farmer that such and such an investigation is not practical, that it will not lead to useful results, that it is a waste of time and money. This is a natural but a short-sighted view. It is natural because a farmer who makes his living by applying science to his industry wants to see how he can make an immediate increase of profit or avoid a loss. It is short-sighted because all applied science is the outcome of pure research. . . . In Canada competent authorities estimate that hundreds of millions of dollars have been added to the wealth of the world by the introduction of Marquis wheat. It may be said that Marquis wheat was the product of an agricultural experiment station, and so it was; but it was the fundamental knowledge of pure science, the science of botany, which enabled the investigator to produce Marquis.—Sir ROBERT GREIG, in the *Scottish Journal of Agriculture.*

Poultry Notes.

June.

JAMES HADLINGTON, Poultry Expert.

The hatching and rearing season will soon be with us. The first week in this month is not too early to start incubation with eggs of any breed. There are poultry-farmers who think that June is rather early, and there are others who will only put down heavy breed eggs this month or next, and who do not set light breeds until August. The writer's advice is to hatch all the chickens possible, whatever the breed or breeds. Owing to the scarcity of eggs there is little fear of too many chickens being hatched so early, but what are hatched are the most valuable that will be raised during the season.

It is such a common experience that better development is attained in early chickens than late ones that it is a remarkable circumstance that one still finds poultry-farmers with some experience who stand for late hatching. It is worthy of mention that laying competitions have exercised an influence in this direction. The stipulation that pullets must be at least seven months old on 1st April makes it almost compulsory for those who wish to compete to set eggs during July—and a large number of them, too, if there are to be sufficient birds from which to make a suitable selection. In short, to have early August chickens the eggs must be set in July.

True, many September hatched pullets probably find their way into competitions, and if pullets always behaved in the way they are expected to do—that is, come on to lay at six months—September pullets would fill the bill. But do they? Is it not to the more mature pullets of August hatching that we owe the bulk of the early starters in the tests, more particularly so in the heavy breed section?

Of necessity, therefore, one must have July or very early August chickens.

The next consideration is how to obtain them. To get eggs for setting in July old hens are not to be relied upon, and it is to pullets we must look for the bulk of the eggs laid in that month. It is right here that the necessity arises to commence hatching operations in June and July, so that mature pullets will be available to breed from in the following winter.

While making these observations with regard to early hatching and the benefits to be derived therefrom, it by no means follows that the writer would favour all chickens being hatched so early. That would be swinging to the other extreme. The whole of August and the first two weeks of September is a good period over which to hatch layers, but it is too late to hatch breeding stock. The ideal periods over which to spread the hatching of a given number of chickens, on an even-running farm, would be 30 per cent. during the six weeks from the middle of June to the end of July, and 70 per cent. during the following six weeks.

During the last two rearing seasons one has heard many farmers declare, "No more September chickens for us!" Their troubles, however, are mostly due to the fact that too few have been hatched before the end of that month, the climax being reached by big batches just before the close of the season. It is admitted that many farmers do well with September chickens, but the majority do not get sufficiently good development in them to constitute them profitable stock.

Exported Chickens.

A digest of the report received by the Department on the results of 600 chickens exported in the first week in January last has already appeared in the press. More details and comment thereon will doubtless be appreciated. The salient points in the report received from Messrs. Sproat & Co., London, are as follows:—

"The consignment consisted of sixty-four Black Orpingtons, and 536 White Leghorns, the respective weights being 2, 2¼, and 2½ lb.

"On arrival of the shipment it was discovered that two boxes were ullaged and contained nothing—all the contents having been extracted en route. To prevent this in future, each box should be wired by the patent method adopted in England and America—simple and effective.*

"The size and shape are satisfactory, except that we would suggest the depth be increased by half an inch. It was found that the lid of the boxes pressed too tightly on the breast of the bird, leaving a mark that detracted from its appearance.†

"If economy can be effected by using wood of less thickness it would equally serve the purpose, providing the measures for safe transit in clause No. 1 be observed. The corner angles of wood inside the box would not then be necessary.

"We have to commend the way in which uniformity has been generally observed and neatness of packing. The placing of birds in the position adopted showed them to the best advantage when the lid was opened. We would impress upon the Department the desirability of studying to make packages attractive.

"As these chickens are required as a substitute for either petits poussins or English spring chickens, the sizes should range from 1 lb. to 2 lb.—not more; as near one size as possible being packed in each case. It must be considered that these chickens are specially of one class, as herein described, and must be sold as such.

"Consignments of these should reach us in future at the beginning of February in order to take precedence of the English breeds which come on the market at the beginning of March. Arriving at this time (in early February) they will command the best prices.

"The Black Orpingtons were good in quality but too dark in appearance. This militated against their sale. What London wants is a *white-fleshed milk-fed bird.*

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* The pilfered cases were, of course, covered by insurance.

† With regard to the suggestion *re* depth of boxes, it would appear that the depth of the boxes sent would meet the case in respect of the smaller chickens recommended.

"It is noticeable in this consignment that necks are dislocated in killing. We would recommend bleeding instead. France, Russia, and America adopt this plan, and thereby produce the best looking poultry on the market.

"We regret to have to report that some of these birds were rejected on account of bruises received in the process of handling when being killed. They must have received rough usage which left its impress on the back—a large patch of discoloration into which blood has flowed. We would point out that these chicks being young and tender of tissue should be treated by killers with the utmost care.

"For a continuation of like consignments on lines suggested there is a fair prospect, but we realise that for the full grown table bird the competition is such as not to warrant shipments until the cost of production is lowered and the economic conditions of your country made easier.

"The full-grown White Leghorn bird is useless as a table bird, and must never be sent as such to our markets."

Particulars of the Consignment.

Full particulars of the consignment appeared in these Notes in February last, but in order that readers may have the full facts before them in considering the financial significance of this trial shipment, they are worth repeating.

The chickens making up the consignment were drawn from Hawkesbury Agricultural College and from the Government Poultry Farm, Seven Hills, and consisted of sixty-four Black Orpingtons and 536 White Leghorns, making a total of 600 birds. The live weight ranged from 2 lb. to 2½ lb. When plucked and ready for freezing the total weight of the chickens packed was net 1,251 lb., or an average of 2 lb. 1 oz. each.

In this connection it might be pointed out that owing to the fact that the birds for export are not "drawn," but only lose their feathers, the weights are not the usual "dressed weights." If drawn in the same way as for local consumption, the weights would have approximated 1½ lb. dressed.

These chickens were not fattened, but were for all practical calculations in ordinary store condition. They were run and fed as usual up to the last two weeks, when the ordinary grain feed given at evenings was dropped out and the chickens were fed entirely on soft mash mixed with skim milk.

The cost of dressing, cases, freezing, delivery, and freight to London was within a fraction of 1s. per bird, a rate that does not appear at all prohibitive. It is as low as is likely under present conditions, and at the same time it is quite as high as it might be anticipated on future shipments, should any be made.

The size of the cases in which the chickens were packed was over-all 27 inches x 13 inches x 7 inches. The number of chickens to the case varied from fifteen to twenty-four.

Comments.

Some further points arise to which attention may be directed.

The first is that the sound birds netted 3s. per pair, which is the equivalent of 3s. 6d. per pair in Sydney, owing to the fact that it costs 6d. per pair to market them. It will be remembered that these birds were hatched at the end of September, and cockerels of that age would meet a glutted market in Sydney. Other things being equal, September chickens are inferior in development at any given age to chickens hatched earlier in the spring.

It will be noted that the report intimates that these chickens, ranging in weight between 2¼ and 2½ lb., would be disposed of in a class as "poussins" or English "spring chickens," weighing 1 lb. to 2 lb. The inference is that birds of some ounces lighter, providing they were plump, would make similar prices. Also that December and January would be good months for them to arrive in London. This is most important, because it means that we could with advantage, from a market point of view, ship chickens of this class from the middle of October all through November. That period would certainly suit poultry-farmers better than the time when the trial consignment was made. At the time and weights suggested by the London agents the cockerels could be despatched practically from the brooder stage, thus enabling farmers to get them out of the way of the growing pullets, and yet to keep them off the local market during the period of glut.

The next consideration and the main one is, will it pay? Looked at from the point of raising chickens to say nine or ten weeks old, 3s. per pair is not an alluring prospect, but that is only one side of the problem. Another side of it is, does it pay to sacrifice chickens which will have cost 3s. per pair to bring to the age at which the sex can be detected with sufficient accuracy to enable the cockerels to be disposed of? It has to be remembered that the value of a chicken when hatched is round about 1s. each, and if only another 6d. each is spent in feed and fuel it means an outlay of 3s. per pair. The point is, will it pay to spend another few pence per head on feed to rescue the 3s. already spent?

The final consideration is the stabilising of the price on the local market for chickens which are often treated as a mere by-product of the egg-farm. Should poultry farmers decide that it is worth their while to follow up what has been done by the Department, the experience gained should be of value.

Seeing that only the feathers are removed, and there is no drawing or other preparation required with the chickens for export, there seems no reason why these chickens should not be packed on the farms. All that is necessary is a little organisation for the supply of cases, and for picking up and delivering to cold stores, where they would be frozen preparatory to shipment. The picking up from the farms could quite easily be done by motor lorries in specific localities on specific days for which farmers have already made co-operative arrangements. It is understood that financial arrangements could be made through Messrs. Sproat & Co., or perhaps other firms.

Orchard Notes.

JUNE.

W. J. ALLEN and H. BROADFOOT.

PRUNING should be pushed along, as it is essential that all the various operations in the orchard should be finished on time.

When pruning young trees the main thing to keep in mind is the establishment of a good framework, and for the first few years of a tree's life it is advisable to cut the leaders well back. The advantages of a good framework are many. They are chiefly: The limbs can carry the weight of fruit; picking, spraying and cultural work is facilitated; the free circulation of air is allowed; the sun's rays are permitted to penetrate, which is an important consideration for bud formation in the centre of the tree. When pruning young trees it is always advisable to encourage them to spread. Spreading trees (but not so spreading as to impede cultural operations) are productive and easier to handle than more upright trees. After a good frame-work has been developed, and if the tree is still making heavy growth, it would be advisable to allow the tree to go unpruned for a season. This will have the effect of inducing it to crop.

In pruning older trees, the characteristics of the various kinds and varieties must be taken into consideration. The pruner should remember that peaches crop only on the previous year's growth, and the older wood will not retain a permanent, self-replacing fruit spur like the apple and pear. In old apple or pear trees it is sometimes necessary to thin out fruit-bearing spurs or they become too crowded.

There is no hard and fast rule that applies to pruning. There are so many factors which influence the tree, such as various soils, location, stocks, and general treatment that the tree receives as regards spraying, cultivation, manuring, &c. Each tree of each variety must be treated individually, and given the particular treatment that will result in the greatest annual production of good fruit. And to do this work intelligently the habits and conditions of each tree must be closely studied.

Fungous Diseases.

Powdery mildew is very much in evidence in many apple orchards, particularly on some varieties, and growers would be well advised to give every attention to it. When pruning this winter the removal of all infected twigs will greatly assist in keeping it in check. This should be followed later on by spraying with colloidal, atomised or atomic sulphur. A leaflet on spraying mildew may be had on application to the Under Secretary and Director, Department of Agriculture, Sydney.

A keen watch should be kept for the San José scale, and the trees sprayed with oil or lime-sulphur.

Apple trees badly affected with woolly aphis should receive a spraying of tobacco wash; a good pressure is essential when spraying to break up the clumps of aphides.

The bandages for codlin moth should still be left on the trees, as the grubs are inclined to leave less protected places as the weather becomes colder. The grubs can be destroyed by dipping the bandages in boiling water some time before spring.

Ploughing.

The ploughing of existing orchards may be started this month. The land is then exposed to frosts, and is in a condition to absorb the maximum amount of rain that falls during the winter, which is stored up for the trees in spring and summer. It is impossible to forecast what the season is going to be, and if the ploughing be delayed later than the beginning of September, there is a possibility that the trees and crop will be prejudicially affected.

Planting.

Where deciduous trees and vines are to be planted this season it is advisable to start the work as soon as possible, as the root growth starts long before the trees commence to shoot in spring. If the planting is delayed the root growth takes place in the nursery and is wasted when the tree is transplanted later. If the soil is dry it would be well to defer planting until rain has fallen.

It is always preferable to crop the land for a season or two before planting, particularly if it previously carried green timber, or if *Armillaria* or white ants were present. The land should be thoroughly cleared, all roots run, and all rubbish raked up and burnt.

When the trees arrive from the nursery they should be carefully examined for any disease or insect infestation, and any weak or poorly developed trees should be rejected. The trees should then be placed in a trench and the roots covered with fine, moist soil, out of which they can be removed for planting as required. When planting avoid wet weather and also dry winds. It is a good plan, should the day be hot or windy, to have a puddle hole and to dip the roots in it as they are removed from the trench.

When digging holes, do not make them too deep. It is a bad practice to plough only eight inches deep and make the hole for the tree a foot in depth. Trees should be planted the same depth as they grew in the nursery, and the land should be ploughed sufficiently deep to allow of this without going past the depth to which the land was ploughed. The tree is placed in the centre of the hole and the roots covered with the fine soil. When the hole is filled, tread the soil firmly with the food. Then level up the hole again with soil that must not be trodden down.

Inter-pollination.

Both locality and varying conditions of weather affect the effectiveness of pollination. It may be taken as a general law, almost universal, that conspicuous flowers are fertilised by the agency of insects. Nature in the great majority of cases prevents self-fertilisation, one of the preventives being that the development of stamens and stigmata does not synchronise. The grower should take effective steps to assist cross-pollination, the need for which is most apparent in the case of pears and apples, and apparent also (though perhaps less so) in some varieties of cherries and of plums, both European and Japanese.

Suitable varieties of the same kind of fruit should be planted in alternate double rows. So long as the flowering periods overlap or synchronise, any two varieties will do. For example, in the case of apples, two rows of Granny Smith might alternate with two rows of Delicious. For market purposes the grower will, of course, choose varieties of commercial value.

The Drying of Figs.

Figs are fit for drying only when they are dead ripe—in fact, they should show signs of shrivelling before being gathered. If they are dried when only partially ripe the product will be worthless, possessing none of the rich flavour which characterises the well-developed and ripe fruit.

The White Adriatic and White Genoa make good dried fruit for home consumption, but the Smyrna variety is preferred by the trade. In picking the figs care should be taken to retain the stalks. The first treatment is to dip them in a caustic solution composed of 1 lb. of caustic soda (Greenbank's) to 25 gallons of water, the object being slightly to break the skin in order to allow the moisture to escape. The fruit is then placed on trays with the bloom end down and sulphured without delay, using 1lb. of sulphur per 200 cubic feet of space. The figs should be subjected to the fumes just sufficiently long (about twenty minutes) to set their colour; over-sulphuring must be avoided. The dipped and sulphured fruit is then dried in the evaporator or by exposure to the sun. If picked when properly ripe it should not take longer than five days of our ordinary summer weather to dry the fruit, though after two or three days' exposure it should be turned. It must not be allowed to get at all hard, but should be removed from the trays while quite pliable.

After the figs have been dried it is well to place them in a close-jointed box with a weight on the top to press them firmly together and bring them into a uniform condition. In a week's time they will be ready for packing, but they should first be immersed in a weak brine consisting of 2 oz. of salt to a gallon of water, which solution should be kept just on the boil. The effect will be to assist crystallisation and to improve the appearance of the product. In packing, the figs should be well worked out between the thumb and finger and packed in boxes or drums holding 1 lb. to 28 lb.—H. Broadfoot, Senior Fruit Instructor.

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alterations of dates should be notified at once.

1925.

Society.	Secretary.	Date.
Wentworth P. A. and H. Society	W. B. Crang	July 15, 16
Peak Hill P. and A. Association	T. Jackson	,, 21, 22
Tullamore P. and A. Association	....	,, 28, 29
Condobolin P. and A. Association	J. Carter	Aug. 4, 5
Bogan Gate P. and A. Association	J. Egan	,, 11
Trundle P. and A. Association	W. A. Tolmie	,, 13, 14
Parkes P. A. H. and I. Association	L. S. Seaborn	,, 18, 19
Forbes P. A. H. and I. Association	E. A. Austen	,, 25, 26
Murrumbidgee P. and A. Association (Wagga)	F. H. Croaker	,, 25, 26, 27
Grenfell P. A. and H. Association	G. Cousins	Sept. 1, 2
Cootamundra A. P. H. and I. Association	W. W. Brunton	,, 1, 2
Manildra P. and A. Association	J. Longley	,, 8, 9
Culcairn P. A. H and I. Society	J. N. Douglas	,, 8, 9
Coolamon A. H. and P. Society	....	,, 8, 9
Young P. and A. Association	T. A. Tester	,, 8, 9, 10
Barmedman A. and H. Society	T. P. Meagher	,, 9
Cowra P. A. and H Association	E. D. Todhunter	,, 15, 16
Ganmain A. and P. Association	A. R. Lhuede	,, 15, 16
Holbrook P. and A. Society	J. S. Stewart	,, 15, 16
Junee P. A. and I. Association	G. W. Scrivener	,, 15, 16
West Wyalong P. A. H. and I. Association	T. A Smith	,, 15, 16, 17
Northern A. Association (Singleton)	S. Griffits	,, 16, 17, 18
Murrumburrah P. A. and I. Association	W. Worner	,, 17, 18
Temora P. A. H. and I. Association	A. D. Ness	,, 22, 23, 24
Canowindra P. A. and H. Association	J. T. Rue	,, 22, 23
Lockhart A. and P. Society	E. D. Arnold	,, 22, 23
Burrowa P. A. and H. Association	W. Burns	,, 29, 30
Barellan P. A. and I. Society	H. H. Cuthbert	,, 30
Corowa P. A. and H. Society	J. D. Fraser	Oct. 2, 3
Griffith A. Society	M. E. Sellin	,, 6, 7
Ardlethan A. Society	R. L. Neill	,, 7
Hay P. and A. Association	C. L. Lincolne	,, 7, 8
Narrandera P. and A. Association	W. H. Canton	,, 13, 14
Ariah Park A. Society	J. F. McInnes	,, 14
Carcoar H. C. and A. Society	T. J. Brady	,, 14
Deniliquin P. and A. Society	P. Fagan	,, 21
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Agricultural Gazette of New South Wales.

Tenterfield Field Maize Competition.

H. WENHOLZ, B.Sc. (Agr.), Special Agricultural Instructor.

FOLLOWING the lead of the Inverell P. and A. Society in successfully conducting a field maize competition the previous season, the Tenterfield P. and A. Society last year initiated a similar competition, which has lately been judged. It was originally intended by the Inverell Society to run another competition last season, and with the object of stimulating a wider interest the society approached the agricultural societies at Tenterfield, Glen Innes, and Armidale to carry out similar plans, the idea being to have the winning crops in each district judged for a northern championship. Owing to the wet season discouraging competitors in the Inverell district because of their weedy crops, the competition was disbanded there for lack of sufficient entries, and the Glen Innes and Armidale districts likewise failed to respond, leaving only the Tenterfield P. and A. Society in the commendable position of carrying on in the face of the attendant difficulties.

The light granite soils of the Tenterfield district do not at first sight seem capable of producing the heavy crops of maize which are obtained in the stronger volcanic soils on other parts of the Northern Tableland, but there are influences which work to the advantage of the former and enable quite respectable yields to be obtained under certain conditions. It will be easily understood that in the past cool season, with its heavy rainfall, the lighter granite soils of the Tableland would fare better in respect to drainage, warmth, and weed control than the heavy black volcanic soils, but some of the leading crops in the competition under review stood out and made good yields also largely by virtue of the effective methods employed by these farmers of restoring or enhancing the soil fertility.

It is a well-known axiom in maize-growing that it is wasted effort to attempt to grow a profitable crop on soils of poor fertility, and the Tenterfield competition affords ample evidence that many farmers in the district are misdirecting their energy in maize-growing, while others have a real appreciation of the truth of the axiom, in so far as the latter are making honest attempts to build the fertility of their soil to the point of raising crops which compare very favourably indeed with those on naturally stronger and richer land elsewhere.

Such is the value of these crop competitions. The comparisons between crops and methods in the same district provide excellent testimony that some farmers carry progressive and businesslike ideas into their farming practice, and the methods responsible for their achievements offer a very useful object-lesson to the others. The comparisons with other districts create a friendly rivalry which spurs farmers on to do their best, and so sets a high local standard which acts as an incentive to the general improvement of the agriculture of the district.

The Season.

The climate of Tenterfield is that of the typical Northern Tableland, with cold, somewhat dry, winters and about two-thirds of the annual rainfall generally falling during the warm growing period. The winter previous to the season under review had been somewhat drier than usual, only about 8 inches falling from April to August inclusive. The subsequent registrations—221 points in September, 495 in October, 560 in November, 331 in December, 902 in January, 284 in February, and 473 in March, giving a total of 32½ inches during the warmer months—indicate that the average rainfall was exceeded by about 10 inches during that period, and show how wet the season was practically throughout. Under the circumstances, weed control was admittedly difficult, but some surprisingly clean crops were to be seen.

The Crops.

The outstanding feature of the crops in the Tenterfield district this season was the wide gulf between the good and the poor ones. Never before has there been observed such a contrast between the maize crops in this district. Never before have such good crops been seen here; and while these may be in part attributed to the season, good methods or systems of farming also played a large part, for many poor crops had the same advantages of season, only to turn out disappointingly. The cause of this marked difference is apparent to even the casual observer—it is simply the difference in soil fertility on the various farms. But such difference in fertility cannot be regarded entirely as inherent. It has largely been brought about by certain methods and practices, and here we have the key to a marked potential progress in the agriculture of the Tenterfield district.

The distinguishing mark of the good maize crops here was that they were to be found chiefly on newly or recently ploughed sod or pasture land. With the exception of the crop of Mr. M. McLaren, which was grown for the most part on a rich black creek flat, the noteworthy maize crops were those of the Cooredulla Estate and Mr. L. Chick, and in part that of Mr. H. Manser.

Mr. McLaren's crop was grown mostly on creek flat, but part of it ran up to the higher ground out of flood reach. Naturally here the crop was not as good as that on the flat, and lost some points for lack of evenness. On the alluvial land, it was estimated that the crop would reach a yield of 90 bushels per acre. Such a yield is exceptional for the Tenterfield district, but these creek flats are very limited in extent, and most of the maize is grown on the granite hill slopes. The land had been fifteen years under cultivation, and although it had grown maize the preceding year, it had been previously under lucerne for some years. This must be considered the best way of utilising these restricted areas, particularly in view of the lack of such a class of feed in the district, but for a few years' spell from lucerne, maize crops make excellent use of such land. The land was ploughed early (July) but could probably with advantage have been given a deeper ploughing than 4 inches. Summer grass and sneeze-weed were the chief weeds present, but the cultivation was generally good under the circumstances.

The Cooredulla Estate (managed by Mr. James Duff) entered a surprisingly good crop of the variety Golden Glow on a granite hill slope. Situated 5½ miles east of Tenterfield on the eastern slope of the range, this country appears normally to enjoy a better rainfall than the western slope where other crops were situated, but in such a season it could not be claimed that the situation favoured the crop to any extent. The present was the third successive maize crop on the land, which had previously been down to grass pasture for many years, and in this practice of systematically breaking up new pasture land for cultivation Mr. Duff has laid the foundation of a system of farm management worthy of emulation and the excellence of which is reflected in the crops and also in the pasture. The land was ploughed during the second week in August, a little too long delayed for the best results to be expected in drier summers, and the crop was fertilised at sowing with 1 cwt. per acre of high-grade phosphate. With good attention to inter-cultivation, the crop was kept fairly clean, the only weeds present being a small growth of sneeze-weed and a little summer grass and paddock love grass.

Tenterfield Maize Competition, 1924–25.

One of the 70-bushel crops that competed. This was Mr. L. Chick's entry.

Mr. L. Chick's crop of Golden Glow was sown on newly ploughed sod land in a somewhat depressed situation on land which might be termed partly sedimentary in formation from the adjacent granite slope. This crop on new breaking further demonstrated the advantage of making use of the fertility which accumulates in the soil during the pasture period. The land was ploughed in July and was well fitted by thorough subsequent cultivation into a nice seed-bed. Although the winter was dry and to some extent precluded ploughing operations it must be borne in mind that an autumn or early winter ploughing of couch grass land is far more effective in getting rid of

grass than a delayed ploughing, and although the preliminary cultivation operations and the inter-cultivation were carried out with much zest and care in this instance, the crop suffered to some extent from the re-growth of couch grass. There were also some patches of water-couch and occasional other weeds, such as fat-hen, amaranthus or boggabri, sneeze-weed, and summer grass, which by comparison brought this crop down in points just below the winning crops.

All the other crops entered were grown on the typical granite hill soils of the district, which had been under cultivation chiefly with maize, but in some cases occasionally with oats or wheat for many years. The yields obtained from these crops were very poor, and prove conclusively that maize-growing under such conditions is an unprofitable business. Exception must be made of portion of Mr. Manser's crop, which was grown on land occupied by Bokhara clover three years previously and on which the effects were still evident to the extent of what was estimated at 10 or 15 bushels difference in yield by comparison with adjacent land which had grown no clover.

Cropping Systems.

The great contrast between the maize crops grown on newly or recently ploughed sod or pasture land and those on land which had been cultivated for some time affords ample evidence that the agriculture of the Tenterfield district can be materially improved, and the opportunity of referring to this in greater detail cannot be allowed to pass.

The holdings in this district are fairly large, and pastures, with their concomitant stock, are the chief interest of landholders, maize being grown on comparatively small areas in most cases. These cultivation areas become somewhat repeatedly cropped, probably largely because of the trouble involved in locating and fencing additional land for the purpose. With maize as the principal crop the exhausting effects of this continued cropping on granite soil not naturally strong in fertility are rather marked, and where this cultivation is continued beyond a few years, only poor crops of 20 or 30 bushels per acre can be expected even in good seasons, while in adverse seasons considerable failure is experienced. Even when an occasional wheat or oat crop takes the place of maize for one season, the depletion in fertility on the cultivated land is not appreciably stemmed.

Yields estimated at 70 bushels per acre for the maize crops on newly o recently broken grass pasture land as compared with 15 to 20 bushels on old cultivation in the competition under review show very clearly that a change in the system of cropping is an urgent necessity with many Tenterfield farmers. These results demonstrate forcibly that the system of cropping newly or recently broken pasture is one that should be extended wherever possible, at least with Tenterfield's most important cultivation crop, and on most farms such a system is sufficiently practicable to justify its immediate and oft-repeated operation. By such means, maize-growing in the Tenterfield district can be lifted from its present distinctly unprofitable level to a very profitable one.

With the recent low prices of maize, only high yields per acre leave much margin of profit, and many Tenterfield landholders might seriously consider the advisability of utilising the present situation by ensuring that their maize crops of the future shall be made profitable by the introduction of the system indicated. A reduction or elimination of the maize area on old cultivation, its supplanting by natural or artificial pasture, and the transfer of the cultivation to newly broken land or areas improved in fertility by pasture is the urgent need of Tenterfield farming. With the advanced prices of sheep in recent years and the late upward move in cattle values, a change to more systematic pasturing could not be without its compensation, and in view of the attendant benefit to maize-growing, its more general introduction would seem to be amply justified. Even were this the only benefit, the change would appear to be of value, but there is undeniable evidence that pasture land is also benefited by the change over to cultivation for a few years. Especially is this the case where fertilisers are used on the crops and leave some residual effect on the land. The system is also advantageous where the rabbit pest or overstocking has destroyed the more valuable components of the pasture and allowed inferior grasses to increase. While such a pasture has lost a good deal of its value for grazing, its ploughing for cultivation will increase that value enormously, while a corresponding area of cultivation land going back to pasture will also be made more valuable.

While on the subject of pasture, mention must be made of clover, and more particularly of Bokhara clover, which has definitely proved itself to be well suited to the climate and soil of the Tenterfield district. Distinct evidence of this is afforded on the farm of Mr. H. Manser, Sunnyside. Mr. Manser sowed Bokhara clover four years ago on portion of his cultivation land and followed this directly with maize, obtaining a yield of over 60 bushels per acre on the clover land, 20 bushels or more per acre better than the yield obtained from maize alongside which followed oats. Both lands grew a crop of potatoes last season, and although no yields were taken, Mr. Manser states that the Bokhara clover land gave a much better crop than the neighbouring land. The paddock is again under maize this season, part of it being entered as the 5 acres for the present competition, and the increased fertility of the land due to the Bokhara clover is still observable in the maize crop to the extent of what appears to be 10 or 15 bushels per acre.

This beneficial effect on the fertility of the soil, still evident after three years, opens up great possibilities for the improvement of the main crop (maize) and incidentally of the agriculture of the Tenterfield district. Add to its restorative effect the fact that Bokhara clover makes valuable pasturage for all kinds of stock, and we have substantial reason for stating that no more promising means of agricultural progress has been indicated to local stock-raising landowners in recent years. Bokhara clover, it may be mentioned, is easily the most hardy of the clover family—a necessary quality for the thin granite soils of Tenterfield—and when well established

will go through dry summer spells making more growth than any other clover and provide also more feed during this time than any natural pasture.

The vigorous growth (7 or 8 feet) of the Bokhara clover in the accompanying illustrations shows how well suited it is to the district. This crop is, *par excellence*, a grazing proposition which should make a big appeal to Tenterfield stock-raisers. As such, of course, it is not allowed to get to the uninviting stage shown, but is kept grazed to maintain a palatable soft growth.

The more general adoption of Bokhara clover on the farm has already been too long delayed in this district, but now that it has definitely proved itself it is hoped that it will be rapidly taken up.

Cultivation Methods, &c.

It is doubtful whether the best results will ever be achieved with maize-growing in this district while the initial ploughing of the land is so universally delayed. Only two fields were ploughed in July, other competitors being as late as September with this operation. It has been repeatedly shown in most districts that maize is somewhat too hazardous a crop for one to depend for its success solely on the rain fall during the growing period. Tenterfield has its dry seasons as well as wet ones like the present, and one would like to see that reserve of soil moisture which is ensured by early ploughing become a more general aim.

Planting in most of the fields is done in rows about 4 feet apart, with single grains 15 to 20 inches apart in the rows. This is probably about correct for normal Tenterfield soils; that is to say, it would probably be about the safest and best planting distance to adopt over an average run of seasons. The Cooredulla Estate crop was sown nearly twice as thickly as this, however, in the rows, and as the season turned out, the land carried such a stand very well; but normally there is rather too much risk involved in such heavy seeding here for an average or adverse season, despite the better soil fertility.

Fertilisers seemed to be recognised as helpful to the maize crop by most of the competitors, and about 1 cwt per acre of superphosphate was the amount most generally applied. One principle regarding the application of fertilisers on these soils needs some mention. It is found that there is a tendency to regard fertilisers as a panacea for the ills of a well worn and long cultivated paddock. It must be distinctly understood that the beneficial effects of fertilisers depend largely on their solution and availability in the soil, and that this state is influenced largely by the presence of organic matter, which is of considerable aid in maintaining the moisture-holding capacity of the soil. Fertilisers may, therefore, be expected to be more profitable when applied to maize on newly or recently ploughed pasture or clover land which contains this organic matter in greater abundance. On long cropped or old cultivated land the organic matter is largely depleted, and no increase in the amount of fertilisers applied can make up for this

deficiency. One point to remember, by the way, in connection with fertilisers is that superphosphate will be found to considerably stimulate the growth of Bokhara clover, and its use on this crop is probably of even greater importance than its application to the maize crop.

Varieties and Seed Type.

It is perhaps significant that in six crops inspected for judging there were no less than five different varieties of maize. It cannot be believed that there is the necessity for this number of varieties of maize to be grown even in the Tenterfield district. Had more crops been inspected, it seems likely—in fact, it is known—that still other varieties would have been found to be grown. All these varieties cannot have equal yielding capacity for the same conditions, and the Tenterfield P. and A. Society might well be supported in an endeavour to eliminate some of the losses occasioned in the district in growing the less productive varieties by another form of contest to discover the best yielding variety.

Bokhara Clover Seedlng.

This crop was on the farm of Mr. H. Manser, Tenterfield.

No conclusions can be drawn from the leading crops in the competition under review as to the most suitable varieties for the district because of the entirely different conditions of their growth. For instance, Mr. McLaren's crop was of Boone County White, a variety entirely unsuitable for the hill soils of the district, while even for the black creek flat it is just possible that it might be bettered by one which would mature more safely. The only variety which was grown by two competitors was Golden Glow, and the crop of Mr. L. Chick scored full points for purity and trueness to type—the result of the bestowal of much care for many years in selection. Wellingrove, Golden Superb, and Iowa Silvermine were the other varieties grown by competitors,

and are by no means to be despised for this district, but further work is required in the shape of comparative tests to determine the most superior of these many varieties.

Concerning purity and trueness to type, some of the varieties are open to much improvement. The problem of keeping maize pure is regarded by some farmers as a difficult one, but an elementary knowledge of the fundamental principles involved renders the solution comparatively easy. Two things are necessary—firstly, a supply of pure seed must be obtained; and secondly, honest efforts must be made to maintain or even improve this purity. The latter is not as difficult in the Tenterfield district with its comparatively isolated cultivation paddocks as it is in other districts, and if it can be done by the exercise of care and a little trouble in these districts, it can assuredly be accomplished at Tenterfield.

Following are the results of the competition with the points scored under each heading:

Competitor.	Germination or stand.	Cultivation and freedom from weeds.	Purity and trueness to type	Freedom from insects and disease	General appearance, evenness, &c.	Yield. (3 points for every 5 bushels estimated).	Total.
Cooredulla Estate.	9	21	13	9	10	42	104
M. McLaren ...	9	21	10	9	7	48	104
L. Chick.... ...	9	18	15	9	9	42	102
H. Manser	7	18	11	9	6	21	72
J. T. Cowin ..	9	18	11	9	4	12	63
W. G. Geyer ...	8	14	13	9	3	9	56

Efforts are being made to have a Northern Tablelands Championship Competition for maize crops next season, and the above results from Tenterfield show that this district will not be by any means out of the running, even with its generally poorer granite soils by comparison with the rich black volcanic soils of other parts of the Tableland. A very useful object-lesson has already been afforded by the present competition at Tenterfield, which should leave its mark for good on the district.

Concrete Floors for Hay-sheds.

"Would concrete make a suitable flooring for hay-sheds? We have always used a wood straddle on the earthen floor of our dairy hay-sheds in this locality, but they have the disadvantage of being a harbour for vermin, besides increasing the risk from fire. If concrete is all right, is it necessary to put broken stone in it, or is sand and cement sufficient?"

The writer of the foregoing, a Camden farmer, was informed that concrete makes the best flooring for a hay-shed. If the sand is creek sand, of gritty quality and clean, it may be used without stone in the proportion of 9 cubic feet to each bag of cement. It should be laid at least 4 inches thick, and inside the post of the shed a permanent kerbing of 4 by 2 inch timber should be laid to protect the edges of the concrete from wear.—A. Brooks, Works Superintendent.

Field Experiments with Maize.

GRAFTON EXPERIMENT FARM, 1924–5.

G. NICHOLSON, H.D.A., Experimentalist.

Time of Ploughing Trials.

It is the practice on the Clarence to plant a considerable area of early-sown maize each season, but the increased yield obtained by early preparation of the land is not fully recognised; in fact, it is considered by some farmers that the extra cost of cultivation entailed by early ploughing is not warranted by the results.

With a view to ascertaining the actual advantages gained by early ploughing, as compared with late ploughing, an experiment was commenced in 1923, when four plots were planted with Leaming maize, as follows:—

1. (*Check*) ploughed in April.
2. Ploughed in June.
3. Ploughed in August.
4. (*Check*) ploughed in April.

The experiment was situated on black alluvial soil fairly typical of the maize-growing areas of the district.

Preparing the Land and Planting the Experiment.

On plots 1 and 4, the maize stubble, after being chopped, was ploughed under on 12th April, and this was followed by disc harrowing on 24th April, 30th June, and 17th July.

On plot 2 the maize stubble, after being chopped, was ploughed under on 18th June, and the disc harrow followed on 30th June and 17th July.

On plot 3 the maize stubble, after being chopped, was ploughed under on 15th August and the disc harrow followed on 5th September.

On 6th September the whole experiment area received a harrowing, followed on 11th September by springtoothing and harrowing.

The maize-dropper with mouldboard attachment was used to plant the experiment. Seeding was at the rate of three grains every 32 inches in rows 4 feet apart, equivalent to 8½ lb. per acre. Planting was carried out on 12th September, the seed-bed being moist and in good order, and an excellent germination throughout was obtained. Each plot consisted of five rows 10 chains long.

The rainfall for the growing period was above the average. September and the first three weeks of October were somewhat dry, but good rains followed during November, December, and January. The maize commenced to tassel early in December, and at that period the soil was well supplied

with moisture. An additional fall of rain about Christmas would have benefited the crop. Otherwise ample rain fell to meet all requirements.

	Points.		Points
Rainfall from 12th September ...	89	Rainfall for December	236
Rainfall for October	312	Rainfall for January	602
Rainfall for November	360		

Some Comments.

From germination onwards, the August-ploughed plot could easily be distinguished by its yellowish appearance and much less vigorous growth, when compared with the earlier-ploughed plots. Shortly after tasselling, the maize in this plot burnt off quickly, and the majority of the cobs harvested were small and light. Practically no difference in growth was noticeable between the April and June plots.

Cultivations in the growing crop consisted of harrowing on 3rd October, cultivation on 29th October, hilling on 11th November, and cultivation on 26th November. All plots received similar treatment from planting onwards. No difficulty was experienced in keeping weed growth in control until the heavy rains fell during January, when wild gooseberry proved troublesome. The experiment was harvested on 24th February.

This season's results are very similar to those obtained last year, and only go to show that early preparation of the land will result in increased yields. When early ploughing is practised the land lies fallow for a few months, and during this period it is possible to conserve a large supply of moisture.

The physical condition of the soil is vastly improved by weathering and by decomposition of stubble, weeds, &c., during such a period of fallow, and a good deal of insoluble plant-food is changed into a more soluble form in which the following maize crop can readily make use of it.

In a season such as that just past, moisture conservation was only of secondary consideration, for good rains fell throughout the growing period. While no doubt this was one of the factors that accounted for the large increase in the winter-ploughed plots it would appear that the early aeration, sweetening, and weathering down of the soil play a very big part in insuring larger returns.

RESULTS of Ploughing Experiments.

Time of Ploughing.	Acre Yield based on percentage.	Increase.	Value of Increase.	Cost of Increase.	Gain.
	bus. lb.	bus. lb.	£ s. d.	s. d.	£ s. d.
August ploughing	27 37	......	......	......	.. ...
June ,, ...	45 23	17 42	2 13 3	2 3	2 11 0
Average of April ploughings	48 21	20 40	3 2 2	4 6	2 17 8

It will be seen that both April and June ploughings were more profitable than ploughing just before sowing, the April ploughing showing the largest net gain. In making this calculation maize was valued at 3s. per bushel, disc harrowing at 2s. 3d. per acre, the April-ploughed section receiving two additional disc harrowings, and the June-ploughed section one additional.

Farmers' Experiment Plots.

WINTER FODDER TRIALS, 1924.

Western District (Dubbo Centre).

B. M. ARTHUR, H.D.A., Agricultural Instructor.

THE following farmers co-operated with the Department in conducting winter fodder experiments during 1924 :—

J. Parslow, "Kelvin Grove," Gilgandra.
S. Reilly, jun., Eurimbla, via Cumnock,
H. B. Loveband, Blenheim, Coonabarabran.

Winter fodders were sown at two centres—Gilgandra and Eurimbla—as part of a definite three years' rotation, consisting of wheat sown on fallow, followed by oats sown on the wheat stubble, and then followed by winter fodders (sown early if possible) in the third year, fed off by stock, or cut for ensilage, and the residue ploughed under not later than September, so as to provide a suitable fallow for the sowing of wheat again the following year.

The object is fourfold :—

(1) To make the maximum use of the ground over a given period.
(2) To provide a rotation of oats, in order to control diseases of the wheat plant such as flag smut, take-all, and foot-rot.
(3) To provide an adequate supply of succulent green feed for sheep (particularly lambing ewes), which are necessary to good farming.
(4) To renovate the soil by the addition of decayed vegetable matter, or humus, and to keep it in good mechanical condition.

The object is sound in principle, but it has been found from experience that it is not always attainable, mainly owing to the peculiar seasons that have been experienced in the western district during the past three years, in which an absence of late summer and autumn rains has made it almost impossible to obtain a satisfactory germination before June, especially as the farmer has not much time to prepare a suitable seed-bed for winter fodders, and they are generally sown after one discing or springtooth cultivation. Consequently it has not been possible for the winter fodders, consisting of Cape and Skinless barley and early-maturing oats, to attain any growth and provide any quantity of green feed for feeding off to stock before it is necessary to plough the ground so as to provide an adequate fallow for the main crop—that is, wheat—the following year. It has also been found that the dry summers and autumns have prevented the working of the land to any extent in order to pre-germinate weed growth, such as black oats, thistles, mustard, &c., and that the continuous cropping of the land for two and a-half years (wheat, oats, and barley) has allowed the ground to become too dirty for the fallow properly to clean up. Given, however, a return to seasons of normal rainfall, it is hoped that this rotation will prove the success that it is expected to, and the experiment will be continued with that object in view.

At Coonabarabran a two-year rotation consisting of wheat, and winter fodders fed off early and fallowed, is being conducted with somewhat better success in regard to cleanness of the land.

RAINFALL RECORDS.

	Gilgandra.	Eurimbla.	Coonabarabran.
	points.	points.	points.
April..	101	169	97
May	56	93	41
June...	186	214	130
July	185	282	190
August	160	139	140
Total	588	897	598

The Plots.

Gilgandra.—Soil black to chocolate loam, of volcanic origin; previous crop oats, 1923, manured with superphosphate. Disced late February, 1924, harrowed 2nd April, and sown 4th April with 50 lb. seed and 56 lb. superphosphate per acre, in four plots of 2½ acres each—(1) Cape barley, (2) Skinless barley, (3) Mulga oats, (4) Sunrise oats. Rain just after sowing effected germination, which was, however, very patchy. Early growth was checked by grasshoppers. The stocking was as follows:—From 28th July to 8th August, 122 sheep: the growth in places was 12 inches high, Skinless barley showing to the best advantage. From 25th August to 3rd September, 126 sheep; 14th September, 129 sheep for three days. Residue ploughed under with disc plough on 17th to 20th September, after rain. Fallowed for wheat plots.

Eurimbla.—Red loam, limestone formation; previous crop oats, 1923. manured with 56 lb. superphosphate. Mouldboard-ploughed March, 1924, sown 2nd April (10 acres), with 55 lb. seed and 56 lb. superphosphate per acre; harrowed after sowing. Germination was patchy and early growth slow. Varieties same as above. Stocking returns were not obtained.

Coonabarabran.—Grey sandy loam on creek bank, poor quality; previous crop wheat variety trials, 1923, manured with 56 lb. superphosphate. Ploughed March, sown 3rd April with 50 lb. seed and 50 lb. superphosphate per acre after 56 points of rain. Area 15 acres (five plots)—(1) Skinless barley; (2) Skinless barley and Grey field peas; (3) Cape barley; (4) Cape barley and Grey field peas; (5) Cleveland wheat. Owing to the dry autumn, germination was poor and patchy. Cape barley and the peas made very poor growth during May, and the peas did not justify their place in the plots. Skinless barley and Cleveland wheat showed to the best advantage, and grew to a height of 18 inches. Stocking was as follows: From 21st July to 10th August, 100 lambing ewes; from 28th September to 28th October, 150 sheep. Residue ploughed under early in November for next season's wheat plots.

Pure Seed Production.

J. T. PRIDHAM, H.D.A., Plant Breeder.

INTERESTING details of pure seed production as controlled by the French Government in Tunis appear in the March *Revue de Botanique Appliquée et d'Agriculture Coloniale.*

The article shows that, in order to assist in the distribution of improved varieties and to preserve their purity, the French Depatment makes seed available to carefully chosen farmers, by whom it is sown for two successive seasons. The first-year sowing is made on small areas (one-twelfth of the area under crop) either in spaced rows or in strips of crop. The product is sown on the same farm the second year, but under ordinary conditions of cultivation. a visit being paid by an inspector or instructor, who gives attention to (*a*) purity of the variety, (*b*) freedom from lodging, rust, ball smut, take-all, and other diseases, and (*c*) general condition of crop, weeds, and probable yield. The seed of this second year is examined by the Department. If it is of good quality it is handed over to the farmer as "*élite* seed" and he is given a bonus. Those who buy the second generation seed benefit on their part, not only by the bonus, but in having the privilege, if they desire it, of an official inspection of their third generation crop and the issue of a certificate guaranteeing it as pure. The Department does not follow the improved seed beyond the third generation.

Recommendations are issued to pure-seed growers, suggesting that they should—

1. Specialise in the growing of a very few varieties.
2. Devote to this object land which has been a worked fallow the previous year and is thus free from self-sown cereals.
3. Separate the sowings of different varieties by a distance of at least 5 feet
4. Avoid catching heads of an adjacent plot in turning when harvesting and contamination with loose sheaves.
5. Clean carefully picklers, drills, threshers, graders and barns.
6. Reject the first bag in stripping and, if possible, harvest an oat plot between two varieties of wheat.
7. Turn all second-hand bags before filling them with grain, and put a label inside and out, a slip of paper or tag, with the name of the variety.

In spite of all these precautions the purity of the sample will be affected if strange plants are not watched for and removed. This work is urgently impressed upon would-be growers of pure seed as of the utmost importance. After harvest the farmer sends the Department a sample of his seed and indicates the quantity he has for sale. The classing of the samples is done under the following headings:—

Purity.—This might be set down at, say, 985, indicating that 985 heads in 1,000 were of the variety grown.

Hardiness—Resistance to weather and diseases—might be stated as 89 as the result of notes made during visits of inspection.

Grade is the proportion in weight of whole grains in the sample to weed seeds, dirt, and broken or smutty grains; 97, say, would indicate 97 whole grains in 100.

Germination.—A count of 924 would signify that 924 grains out of 1,000 germinated under normal conditions.

In connection with the last, it may be said that germinating power improves after harvest; while not above 70 per cent. in December in this country, it might reach 95 per cent. or more in March. For this reason barleys, especially those harvested in districts of good rainfall, are unsuitable for malting for several months after harvest.

It is suggested that growers of pure seed wheat in New South Wales would also find it profitable to grow pure seed of a similar number of varieties of oats. For rotation purposes, harvesting and keeping samples pure in threshing, the oats would be very useful.

"The Welsh Journal of Agriculture."

Yet another official journal on agriculture! For the purpose of bringing under the notice of farmers and others the work done in the Principality of Wales, the Ministry of Agriculture has commenced the issue of an annual publication, the first of which is before us. Its 250 pages contain matter of quite exceptional merit and interest, summarising both historical and experimental agriculture in several directions. The journal contains plenty of evidence of the immense amount of research work that is being done on behalf of primary producers of all lands and all interests, and its appearance suggests the reflection that perhaps the greatest problem of all is how the said producers are to be affected thereby in their practice.

The publishers' inscription reads: "Published for the Welsh Agricultural Education Conference by the University of Wales Press Board (Cardiff), and sold by all booksellers," but provision appears to be made for a good many copies to be distributed gratis.

Return of Infectious Diseases Reported in May.

The following is the return of outbreaks of the more important infectious diseases reported during the month of May, 1925:—

Anthrax	Nil
Contagious pneumonia of swine	,,
Pleuro-pneumonia contagiosa	2
Piroplasmosis (tick fever)	Nil.
Swine fever	,,
Blackleg	1

—Max Henry, Chief Veterinary Surgeon.

Sudan Grass at Nyngan Experiment Farm.

S. RUDKIN, Manager, and A. W. S. MOODIE, H.D.A., H.D.D.,
Assistant Agrostologist.

THE usefulness of Sudan grass as a summer growing crop for the drier districts of New South Wales where rain in the summer may be expected has been proved on the commercial areas of the above farm during the last five or six years. As a crop for the stockowner it may be utilised by him for grazing, silage, and hay-making, the two former being most important. The success with this crop at Nyngan has been obtained under natural conditions, no irrigation with bore or other water being carried out.

Since 1920 only one failure has been recorded; this was during the 1922-23 season, and was due to excessive heat, drying winds, and the absence of rain after germination. During the 1923-24 season the area was fed off before the December rains, and continued to provide good grazing until early in May.

The 1924-25 season gave excellent results from this crop, growing conditions being favourable, and it was decided to conserve the crop as silage. The pit method of ensiling was adopted as being the cheapest, simplest, and most effective under local conditions. The crop is easily handled for silage, being cut with a reaper and binder.

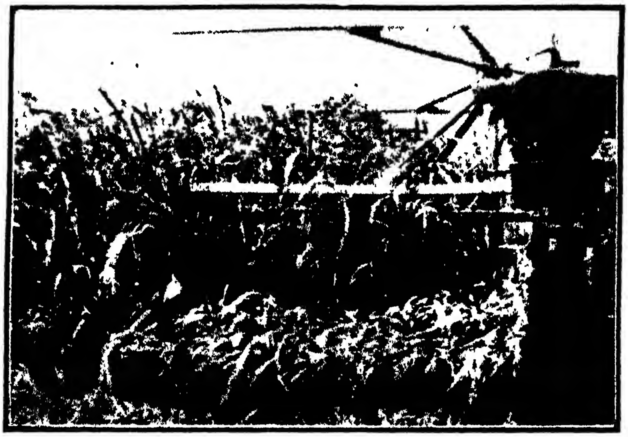
Sowing was carried out from 1st to 3rd September on well-prepared land at the rate of 10 lb. seed per acre, sown with 30 lb. superphosphate through every hoe of the drill. Sowing through every grain run has proved superior to wider spacing between the rows; yields are heavier, the crop has finer stems, weeds are choked out, and the ground and crop are in better condition for harvesting with the binder. Rapid growth was made, and horses, sheep and cattle were all grazed on the area at various times until 13th October, when the ground was bare. Between this date and 2nd December, when it was cut for silage, the crop grew to a height of approximately 5 feet, the average yield being calculated at 2 tons 14 cwt. 3 qrs. per acre. This growth was made in forty-nine days on 735 points of rain. The sample proved to be green, succulent, and fine-stemmed, and an excellent sample of silage should result. The areas are still (May, 1925) providing grazing.

A further use made of this grass is to scatter the seeds when ploughing in rabbit burrows, the ensuing growth being superior to the natural herbage. It was also noticed that rabbits did not attempt to reopen the burrows where the grass had obtained a good hold, whereas on areas where the grass was not sown the burrows were again opened up.

With regard to feeding-off this crop it may be stated that no cases of poisoning have been recorded so far through stock grazing on Sudan grass at Nyngan, although it has been fed off at all stages of growth and by all

classes of stock. Its fodder value is demonstrated by the fact that working horses do well on this grass, but will fall away if only the natural herbage is available.

There is little likelihood of poisoning resulting at Nyngan and in similar districts, provided pure seed is obtained in the first place and



Harvesting Sudan Grass for Silage.

reasonable care is exercised in keeping it pure. In districts where crop-growing is carried out on a large scale there is frequently a danger of cross pollination occurring with a crop of sorghum, growing possibly on an adjacent holding and over which the Sudan grass grower has no control.

Filling the Silage Pit.

This interpollination results in the hybrid plants which appear to be the chief cause of trouble in cases of so-called Sudan grass poisoning. At Nyngan, however, it is unlikely that any plants belonging to the sorghum group would be growing in the vicinity, and graziers can make use of this very valuable crop with perfect safety.

Sheep Feeding Trials.

A. H. E. McDONALD, H.D.A., Chief Inspector of Agriculture, MAX HENRY, M.R.C.V.S., B.V.Sc., Chief Veterinary Surgeon, and F. B. HINTON, Sheep and Wool Expert.

THE question of providing additional food for ewes and lambs when the latter are intended to be marketed as fat lambs, has for some time been felt to be deserving of the attention of the Department. Requests from several sources that investigations be undertaken, led to the matter being referred to the Research Council, a sub-committee consisting of the authors, being subsequently appointed to arrange and control the work

As practically no work of this nature had previously been undertaken in this country, and as conditions here, both as regards the raising of livestock and the growing of feed, differ markedly from those in countries in which experimental work has been carried out, it was necessary to commence with very simple experiments in order to collect data on which to continue investigations. As there were no basic data to operate on, the initial series of experiments as framed may appear to many to be insufficiently comprehensive and extended to warrant much value being placed on them, or even to be badly framed. The sub-committee considered, however, that it was necessary to make a start in this way for the reasons outlined above.

It is, of course, hazardous to draw conclusions from a single experiment or a single year's work, but the members of the sub-committee felt that it was desirable to publish the results of the first experiment so as to indicate what line of research is being pursued. The series will be repeated in the coming season.

Scope of the Experiment.

This first experiment was carried out at Bathurst Experiment Farm and was laid down as follows:—

(*a*) Approximately 150 ewes and their lambs to be run on fodder crops and fallows during the day, and at night to be drafted into three lots (each lot having previously been branded with a distinctive brand).

(*b*) Each lot to be yarded separately. Lot 1 to be supplied with roughage and maize, 6 oz. per ewe. Lot 2 to be supplied with roughage and oats, 6 oz. per ewe. Lot 3 not to be hand-fed.

(*c*) The feed to be given in bag troughs in the yard where the ewes are being kept for the night.

(*d*) The usual departmental lick to be supplied to each lot in the yards at night.

(*e*) The object of the trial is to ascertain whether it is profitable to supplement with the above concentrates the ordinary feed available to ewes with lambs in a district where lamb-raising may form a remunerative branch of farm practice. The lambs in each lot will be weighed at the commencement and at the conclusion of the test, and a detailed account will be kept of the cost of the extra feeding.

The trial was commenced on 22nd August, the lambs being then an average of seven weeks old. The ewes and their lambs were divided as follows:—

Lot 1.—57 lambs and their mothers
,, 2.—56 ,, ,,
,, 3.—51 ,, ,,

Two lots were given distinctive brands so that they could be easily drafted off each evening. Every lamb was weighed at the beginning of the trial and three months later, when it was considered that about half of the lambs were fit for market.

For three weeks very little of the feed which was given in shallow bag troughs was eaten, and most of the roughage was scattered about by the sheep. The roughage given was straw chaff. On account of this waste it was decided to dispense with the roughage and feed the grain alone. By the end of September all the feed was being cleaned up readily. Very little difference in appearance could be noticed between one lot and another during the course of the trial, except that towards the end the lambs in the oat-fed trial had more bloom on them. The season was very favourable to the growth of the fodder crops and green feed was plentiful up to the end of the trial. Throughout the trial all the sheep, both ewes and lambs, were in excellent health.

The Results.

The following table shows the average weights of the lambs at the start and three months later, when it was decided to dispose of half of the lambs:—

Lot.	First weighing.	Second weighing.	Increase.
	lb.	lb.	lb.
1. Roughage and maize, 6 oz.	37·1	68·0	30·9
2. Roughage and oats, 6 oz.	42·7	74·0	31·3
3. No hand feeding	36·7	66·5	29·8

The second weighing took place on 3rd December, but the marketable lambs were not sold at Flemington until 11th December. Earlier experiments have shown that a certain amount of bruising occurs when weighing the lambs, and on this account a full week is always allowed to elapse between the day of weighing and the day of sale. The remainder, which comprised the younger lambs of the drop, were continued on the same ration and were marketed on 22nd January.

The following table shows the average price realised at each sale and the combined average :—

Lot.	First Draft.		Second Draft.		Total No.	Combined Average Price.
	No.	Average Price.	No.	Average Price.		
		s. d.		s. d.		s. d.
1	27	37 0	30	28 7	57	33 1
2	33	38 7¾	21	29 0	54	34 10½
3	28	30 9¼	23	27 0	51	29 1¾

The difference in price realised at the two sales is explained by the facts that, on account of the pastures going off somewhat, the second draft were rather dry in apppearance when sold, and that the lamb market on 22nd January was lower than usual.

As the full amount of grain was not eaten, particularly at the beginning, the quantity was reduced then increased gradually, so that the sheep just cleaned up the amount of grain given, the amount never exceeding 6 oz. per ewe.

A record was kept of the total amount of grain given to the two lots which were fed. The following table shows the amount of feed used, the price, and the average cost per lamb at current market rates, with the final average value per lamb :—

Lot.	No. of lambs.	Amount of grain used.	Cost per bushel.	Total value grain.	Cost of grain per lamb.	Final average value per lamb.
			s. d.	£ s. d.	s. d.	s. d.
1	57	1,314 lb. maize ...	5 0	5 17 4	2 0¾	33 1
2	54	762 lb. oats	4 7	4 7 4	1 7½	34 10½
3	51	....	.....	....	......	29 1¾

This shows an average added value for the lambs fed on oats of 5s. 8¾d., and for those fed on maize of 3s. 11¼d., over the lot which had no extra feed. As a matter of fact, in the case of the first draft fed on oats, the cost of grain per lamb works out at a little under 1s. 5d., while that for the second is about 1s. 11d. This will increase the advantage of the lambs fed on oats in the first draft to 6s. 5½d. above the lambs receiving no extra feed. In the case of the second draft the advantage is only 1d., which is a rather remarkable contrast. The first draft of those fed on maize cost just under 1s. 9d. to feed and consequently show an advantage of 5s. 3d. over those not fed on grain. The second draft cost 2s. 4½d. in feed, and consequently there was a loss of 7½d. on this draft. This marked difference in comparative values does not appear capable of satisfactory explanation and the point will oe carefully watched.

The work entailed in drafting and putting out the feed each evening has not been considered in these results. Under ordinary conditions very little work would be necessary, as after about a week the sheep would come readily to the feed trough placed in the paddock.

These results tend to show that extra feed in the shape of concentrates is of value in forcing the growing lamb. Feed given in this manner should be specially valuable if the season becomes dry, resulting in the green feed not being as succulent as it should be.

What the Results Indicate.

These experiments, though still in the preliminary stages, should be particularly interesting to farmers in the wheat belt, and to those on the tablelands who, while not able to produce wheat economically, can obtain excellent yields of oats. For some time wheat-growers have recognised the many advantages of sheep in conjunction with agriculture, but have been restricted in their operations by the limited amount of grazing.

Wheat is an excellent pioneer crop, but the time inevitably arrives, sooner or later, when difficulties arise through the continued use of the land for this one crop. The fertility of the land is reduced, weeds become troublesome and diseases such as take-all, flag smut, etc., take heavy toll of the crop. Fallowing overcomes some of the difficulties to a certain extent, but brings others in its train. What are needed are other crops for growing in rotation, preferably such as will enable more stock to be carried upon the farm; for stock have been recognised as the great soil renovator from time immemorial, because of the value of their excreta as a fertilising agent.

Recent increases in the value of sheep have now made it possible for farmers to utilise them to a greater extent on their high-priced land. These experiments have been designed with the purpose of ascertaining to what extent it is possible to feed grain. Maize and oats were used, but the possibilities of the latter are the more interesting. Mr. J. T. Pridham, Plant Breeder, has been singularly successful in recent years in producing oats suitable to dry conditions, and thanks to his efforts most wheat-growers are now in a position to produce this grain. So far, however, the crop has not been extensively grown owing to the poor market. Frequently when the yield is satisfactory and the condition of the pastures good, the price of oats is low and unprofitable.

The results of the experiments indicate that even when such a high price as 4s. 7d. is allowed for oats, the feeding of them to ewes and lambs gives a profit; they show how the oat crop may be used to advantage. If they are a true indication of the value of oats as a feed for sheep, they are of considerable importance and should lead to a more stable form of farming.

The sub-committee wishes to acknowledge the assistance given by Mr. H. G Belschner, Government Veterinary Surgeon, Mr. E. A. Elliott, Assistant Sheep and Wool Expert. and Mr. R. G. May, the Manager of the farm.

Biennial Bokhara Clover at Tenterfield.

A. W. S. MOODIE, H.D.A., H.D.D., Assistant Agrostologist.

A CROP which should be exceedingly useful in parts of the Northern Tableland district is Bokhara clover (*Melilotus alba*). When first introduced to the State many farmers tried the crop, but failures in germination and other causes made many suspicious of the somewhat extravagant claims made for it. In the Tenterfield district, however, it was recognised by a few farmers as particularly suitable to local requirements and conditions, and, after five or six years' experience, they are prepared to strongly recommend it for grazing and for hay, and as a rotation with maize or potatoes or both.

While it is recognised that this clover is suited to a wide range of soil and climatic conditions, it is not suggested that trials should be made in all parts of the State, but rather it is desired to point out the value of the crop to portions of New England, on land unsuitable for lucerne as a grazing proposition.

Shortly after its introduction, the main objections urged against this clover were as follows:—

1. The difficulty in obtaining a stand.
2. Unpalatability on account of its characteristic flavour.
3. The hard woody stems developed by the plants when not properly fed off.
4. The milk from cows fed on Bokhara clover was tainted.

Most of these objections were due, however, to lack of knowledge of the requirements of the crop, and, as may be pointed out, they may be avoided, and full use made of it as a crop that will grow on soils too wet or too dry for lucerne, act as a soil renovator, and provide a large amount of good fodder.

The following is an account of the methods followed by Mr. A. Sommerlad, Orchard Hill, Tenterfield, and Mr. H. Manser, Sunnyside, via Tenterfield.

Bokhara clover can be produced on practically any soil in this district, provided it contains a sufficiency of lime. The land should be prepared well in advance of sowing, but the seed-bed should not be worked down too fine, and should above all be firm. The seed should be sown from the middle of July to the end of August, at the rate of 12 lb. per acre, being broadcasted, or drilled so that it is just dropped on the surface. This is followed by the roller and gives the seed sufficient covering. Mr. Sommerlad considers it essential to complete this operation by rolling to ensure a satisfactory germination.

When the crop is 8 inches to 10 inches high, grazing may commence and be continued until the autumn or early winter, when growth ceases. The

following spring shoots come away from the crown of the plant as with lucerne, and when sufficient growth has been made stock may be again depastured on it.

After the growth from the crown of the plants at the beginning of the second season, all further growth is made from the base of the stems. This point is most important, especially in utilising the crop for hay, as will be explained later. The crop in the first season should not be fed off too heavily, but when eaten down should be given a short time to recover. If it is desired to make the pasture permanent the clover should be allowed to ripen seed at the end of the second year. This seed will fall and germinate the following spring without any assistance, and a good stand is thus assured. Stock should be pastured on Bokhara clover during its first year's growth in order to accustom the animals to its unusual flavour. It will then be readily eaten during the second season.

Sweet or Bokhara Clover (*Melilotus alba*).

Bokhara Clover for Hay.

A fair sample of hay may be made from this clover, although, owing to its coarse stems and the liability of the leaves to fall easily during curing, it is a little more difficult to prepare than lucerne. Hay should only be made from the first year's growth, the stems being much softer and more palatable as hay than the harder woody second year's growth. Cutting may be done with the mower and the hay allowed to remain untouched until about half-cured. It is then raked into windrows and cured a little more, but before it gets thoroughly dry, and before the leaves commence to drop, it should be cocked to complete curing. If it is desired to cut the second year's growth for hay, it must be remembered that the growth during this

period comes mainly from stem buds, and the cutting should leave a stubble at least 6 inches long from which further growth will take place.

If seed is required it may be allowed to set and harvested at the end of the second season. Sufficient will fall during this operation to resow the paddock for the following spring, and the resulting crop should be heavier and richer than the first grown on the land, owing to the soil being well inoculated.

Biennial Sweet Clover in the Rotation.

It has been found that soils in the Tenterfield district, as indeed in many parts of the State, lack humus, and with continuous cropping the production of maize or potatoes soon falls off. The best crop for use in a rotation in the Tenterfield and similar districts would appear to be Biennial Bokhara clover, because of its deep-rooting system, which penetrates the soil to great depths, assisting in drainage and aeration, in the fixation of atmospheric nitrogen, and in the addition of humus at the end of its growing period, as well as providing good grazing.

Maize or oats stubble, cultivated or disced, form an ideal seed-bed, as the soil is well compacted and suitable for germination and growth. The clover is allowed to run its full period, being pastured in the ordinary way, and at the end of the second year is allowed to seed as usual. The land may then be prepared for maize to be sown the following spring. A fair quantity of clover will germinate, but is easily controlled and, as pointed out, is no disadvantage. Two successive crops of maize may be produced in this way, and as that is probably all the land will carry, it should be allowed to revert to clover pasture, the seeds already held in the soil giving a good stand and resowing being usually unnecessary.

A good stand of Bokhara clover can often be obtained by sowing unscarified seed in the autumn, on crop land just thrown out of cultivation, without any preparation, the seed germinating freely in the spring. Both Mr. Sommerland and Mr. Manser state that maize yields are largely increased on land after Bokhara clover, and Mr. Manser has had very good results with potatoes. On Mr. Manser's property, the difference between maize grown after Bokhara clover and on ordinary cultivation land was very markedly in favour of the former.

Treatment of the Seed.

To ensure a good stand of Bokhara clover with spring planting, it is essential that besides observing the points previously set out the seed should be scarified, owing to the very high percentage of hard seeds found in every sample. Scarification may be carried out as follows:—To a piece of board about 12 inches square tack sandpaper. Spread the seeds on a concrete floor, having a thin covering of seeds only, and then rub with the sandpaper. Do not rub too heavily or the seeds will be broken, but keep them moving so that all seeds will be scratched slightly. A little experience will soon show the amount of pressure that can be safely applied. The seed is then ready for sowing.

Experiments carried out in the Seed Testing Laboratory show the advantages to be derived from scratching the seeds, the following results having been obtained:—

Treatment.	Germination in 6 days.	Germination in 15 days.
	per cent.	
Hulled seed, scarified	74	79
Unhulled seed, scarified (hull being removed in operation of scarifying).	43	56
Hulled, unscarified	2	3
Unhulled, unscarified	3	7

The germination of the seed scarified without previous hulling could probably be improved by prolonging the sacrification process to make up for the rubbing necessary to remove the hull before the actual scarifying takes place. The germination should then approximate to the figures given for hulled scarified seed.

General.

Bokhara clover, once established, will spread from the original area if allowed to set seed, and will improve pastures in this way It must be kept fed close to prevent woodiness and unpalatability, and it will produce a large quantity of grazing, especially in its second year.

If cattle do not take to it immediately on account of its strange flavour, they will do so after two or three days, and become exceedingly fond of this clover, which has a feeding value almost equal to lucerne. No trouble has been experienced from bloating in this district.

At Tenterfield, Bokhara clover has always been successful on clay soils, and on all soils that are inclined to break up in a rough state.

It is stated at Tenterfield that properly fed Bokhara clover imparts no ill flavour to milk, but in the case of such a flavour becoming apparent, aeration removes the taint. On the contrary, cows become very fond of the clover, and the milk flow is considerably augmented while they are feeding on it.

Sheep take to this clover readily, and it keeps them in good condition.

It has been found growing round rocks, where no cultivation could possibly have assisted in its establishment, so may prove to be of importance in converting these waste places into useful grazing patches.

Eradication, if desired, must not be attempted during the first year, as ploughing out is ineffective owing to the crown shoots, but it is easily accomplished the second year by preventing the plants from seeding, and at the end of the growing period ploughing up the area.

Bokhara clover may be sown with nurse crops like wheat or oats, but the cereal should be sown very thinly, as in the event of a thick sowing and a dry spring, the clover may be checked in growth.

It has been previously pointed out in the *Agricultural Gazette* of New South Wales, vol. 34, pp. 628 and 852, that Bokhara clover seed when mixed with wheat in quantities over 3 per cent. (by count) is liable to cause the flour and bread made therefrom to have the characteristic scent of the clover, and a process is also explained by which this scent may be removed. As, however, the latter process would prove costly, and possibly troublesome, the growing of this clover in grain wheat districts is not advocated for the present. It may be stated, however, that this plant, being a biennial, should not cause as much trouble in this way as the annual Hexham Scent (*Melilotus indica*).

At the present time, experiments are being carried out by the Department in the Northern Tablelands districts to determine the adaptability of this valuable fodder to different situations, and to fully test all the claims made for it, the results of which will be given at a later date. It is hoped, however, that from the results achieved by Tenterfield farmers, and following the points outlined for the successful cultivation of this clover, additional areas will be laid down to this crop by farmers in similar localities.

Feeding the Dairy-bred Calf.

While good breeding is essential to success in stock-raising, the Canadian departmental publication, *Seasonable Hints*, points out that the best of breeding may become of little value if the young animals are not properly raised. This is particularly true of the dairy-bred calf. The young of practically all other classes of stock are reared by their dams in the natural way, and so long as the dam is well fed and proper housing is given, the young are assured of a good start in life. Not so with the dairy calf. In the majority of cases, and certainly in all cases where economy is any consideration, the calf is taken from its dam when a few hours, or days, old and reared by hand. The efficiency of the method of hand-feeding followed has much to do with the ultimate size, strength, and usefulness of the animal.

Further Experiments in the Drying of Apricots.

The following results were obtained last season in drying experiments with apricots at Hawkesbury Agricultural College:—

Experiment No. 1—168 lb. of fruit dried out to 30 lb. 8 oz. in 15 hours at 125 deg. (Pits weighed 10 lb.)

Experiment No. 2—89 lb. of fruit (whole) dried out to 20 lb. 2 oz. in 31 hours at 125 deg.

Experiment No. 3—71 lb. of fruit dipped in caustic soda (1 lb. to 30 gallons boiling water) and dried whole was reduced to 17 lb. 6 oz., and took 25 hours to dry at 125 deg.

Experiment No. 4—42 lb. of fruit dipped in caustic soda solution, then halved (pits weighed 3 lb.) dried to 6 lb. 8 oz., and took 13 hours to dry at 125 deg.

Experiment No. 5—78 lb. of fruit (pits extracted), left whole dried out o 12 lb. 15 oz. in 28 hours at 125 deg.

Variations in Samples of Copper Carbonate.

A. A. RAMSAY, Chemist.

BUNT, or stinking smut, has long been recognised as a destructive disease of wheat. In general agricultural practice, the remedies formerly used for the control of bunt were :—

(*a*) Wet pickling with bluestone and lime.

(*b*) Pickling with formalin.

Some years ago, the use of copper carbonate dust was suggested as a bunt-destroyer, and within the last two or three years dry pickling with copper carbonate, has largely displaced the wet pickling methods.

The advantages of dry pickling are :—

1. Control of the disease is particularly effective.
2. Injury to germination is reduced to a minimum.
3. Wheat, after dry pickling, can be kept without injury, which is not the case with wet-pickled wheat.
4. Seed wheat can be treated at a local centre at any time, and afterwards distributed.

The method has now been so generally adopted that a very considerable amount of attention has been directed to the comparatively new bunt-preventing product, copper carbonate, and it is therefore considered that a discussion of the nature and composition of the product and its manufacture would be of interest.

As sold for bunt-prevention in wheat, copper carbonate consists of (1) basic copper carbonate as precipitated and dried, together with (2) an inert substance added as a diluent or filler. The proportions in which (1) and (2) are present are subject to variation.

Basic copper carbonate is usually prepared from the interaction of aqueous solutions of crystallised copper sulphate (bluestone) and sodium carbonate. Basic copper carbonate is precipitated, and at the same time small quantities of basic copper sulphate are unavoidably produced, while the supernatant liquid contains sodium sulphate in solution. It will be readily understood that when this supernatant liquor is drained off, the precipitate will contain a certain proportion of the supernatant liquor, the amount retained depending on the nature of the precipitate—whether tending to be crystalline or amorphous. When such a precipitate is dried it will contain a certain proportion of sodium sulphate derived from the supernatant liquor, and if excess of sodium carbonate were used in the manufacture, a certain amount of sodium carbonate or sodium bicarbonate might also be occluded. The presence of these impurities (sodium sulphate and carbonate) will, of course, reduce the percentage of copper in the basic precipitate—the greater the impurities the smaller the amount of copper in the precipitated mass. To remove such impurities, it would be necessary to

wash the precipitate with water before drying. It should be noted that there is more than one " basic copper carbonate " ; in fact, there are quite a number of basic copper carbonates known, in which the ratio of copper to carbonic acid is different. Similarly, there are many " basic copper sulphates," in which the ratio of copper to sulphuric acid is different.

Our experience indicates that the basic copper carbonate usually present approximates to the composition of the mineral malachite, in which two molecules or parts of copper oxide are present to each molecule or part of carbonic acid. The basic copper sulphates present are those containing three, four, or eight molecules or parts of copper to each molecule or part of sulphuric acid.

As representing the composition of the basic copper precipitate when dried, which is obtained from the action of copper sulphate and sodium carbonate, the following may be given :—

Sodium sulphate ...	11 09
Sodium carbonate ...	0·29
Sodium bicarbonate ...	0·60
Oxide of iron and aluminium ...	2·44
Basic copper sulphate ...	3·97
Basic copper carbonate ...	81·61
	100·00

A pure calcium carbonate is generally used for the diluent, though calcium sulphate (gypsum) is sometimes used for this purpose.

As representing the composition of various preparations sold for use in dry pickling wheat the following are given :—

	Sample No. 1	Sample No. 2	Sample No. 3.	Sample No. 4.	Sample No. 5	Sample No. 6.
Sodium carbonate ...	0·56	0·37	0·79	1·85	0·26	0·32
Sodium bicarbonate ...		.		..	0 53	...
Sodium sulphate ...	4·70	6·32	16·19	4·60	9·84	3·46
Calcium carbonate ...	29·79	23 73	18·50	28·93	10·64	36·68
Oxides of iron and aluminium	1·14	0·96	1·12	0·60	2·16	1·21
Insoluble matter ...	0 89	0·84	3·66	1·35	0 19	10 06
Basic copper sulphate ...	7·16	8·23	0·98	12 00	3·52	8·77
Basic copper carbonate ...	55·02	60·11	53 78	50·05	72·36	35·99
Undetermined ...	0·74	...	4·98	0·62	0·51	...
	100 00	100·56	100·00	100·00	100 00	100·09
Copper oxide content. ...	43·18	47·06	35·14	41·06	50·74	32·97
Probable composition of basic copper carbonate present	$CuO^{2.24}$ Co_2 $H_2O^{2.47}$	$CuO^{1.97}$ Co_2 $H_2O^{2.03}$	$CuO^{2.11}$ Co_2 $H_2O^{2.88}$	$CuO^{2.07}$ Co_2 $H_2O^{3.14}$	$CuO^{1.04}$ Co_2 $H_2O^{1.76}$	$CuO^{2.09}$ Co_2 $H_2O^{1.79}$

That basic copper carbonate preparations sold for bunt prevention are liable to vary in composition is indicated by the following figures, which represent the percentage of copper oxide present in certain samples received between January and July last year :—

Percentage of copper oxide :—34·82, 36·13, 30·86, 41·12, 35·14, 47·06.

Similar variation occurred in the composition of lead arsenates when that product was first placed on the market, but competition and increased knowledge has effected a general improvement in quality, and it is confidently anticipated that the same factors will bring about the production of basic copper carbonate of better and more uniform composition.

Notes on Some Varieties of Strawberries.

The following notes on varieties of strawberries which are popular in Victoria and South Australia and which have been tried in recent years in this State are supplied by Mr. L. Gallard, Orchard Inspector, Eastwood.

Melba is considered by several of our old growers to be almost, if not quite, identical with our Creswell's Seedling. I remember taking an old Victorian grower (who then had some Melbas growing) to see our Creswell's. We compared the fruit, and he was of the opinion that they were identical, and neither I nor the local grower could observe any marked difference in the fruit or plants. We have another variety which was introduced from Victoria under the name of Doncaster which is very much the same. Personally, I think they have all originated from Creswell's. A number of seedlings have been raised in this State from the Creswell, among which are Doctor, Moree, and Glenfield. The chief difference is that in nearly all cases the berries are more uniform, have a smoother surface, and if anything a rather brighter colour. The texture of the fruit may vary a little, but as far as I can see the difference is very slight, and it is questionable whether the outstanding characteristics are sufficient to justify their being made new varieties.

Sunbeam has been given a trial. It created a fair impression at the start, but did not last.

Royal Sovereign with us bears a few very fine berries and a lot of small ones, and does not yield satisfactorily.

Ettersburg 98 has been grown in North Ryde for the last two years with very good results. The fruit is very good, surpassing Creswell's both in size and flavour, but not coming near Creswell's in the second crop. It produces a good first crop, and the crop ripens much earlier than Creswell's, but like Malakoff it fails to develop its second crop satisfactorily. It is being sold locally as Port Macquarie. The extra price that it commands in the market is the only thing that enables it to compare with Creswell's from a commercial point of view.

Illawarra has not given satisfaction here.*

Where Creswell's is free from disease it more than holds its own with any of the above varieties, but unfortunately during the last few years it has been suffering from an unidentified disease which has been causing a great deal of anxiety. On account of this, growers have been trying to get another variety to take its place, but so far they have not been able to do so. In the writer's opinion Ettersburg 98 has come nearest to it.

* The comment should be taken as referring only to the Epping, North Ryde, Eastwood and surrounding districts. In some parts of New South Wales, especially on the South Coast, Illawarra does very well.—W. J. Allen.

Sheep on the Coast.

WITH SPECIAL REFERENCE TO NORTHERN DISTRICTS.

F. B. HINTON, Sheep and Wool Expert.

SHEEP-RAISING has proved such a profitable and attractive occupation in most parts of New South Wales that the prospect of a possible extension of the industry to coastal districts has exercised the minds of many people not thoroughly conversant with the conditions requisite for success. It is for the purpose of replying to the inquiries which are received from time to time from farmers as to the possibility of sheep-farming on the North Coast that the following information—summarising departmental experience and conveying that of a number of farmers in the Brunswick and Tweed districts—has been compiled.

Departmental Experience.

As pointed out in 1921 by Mr. J. Wrenford Mathews (then Sheep and Wool Expert of the Department), climate is a primary factor in the success or otherwise of sheep-raising. Suitably placed as regards breeds, sheep will thrive as well in a hot, dry climate as in a wet one, but few breeds will adapt themselves to a humid climate. New South Wales possesses climatic conditions which range from cold and dry to hot and dry, but in the northern rivers districts the atmosphere attains a high state of humidity. For trial in these districts, the Romney Marsh sheep, which has been bred for generations upon the lowlands in the county of Kent on the seaboard in the south-east corner of England, was considered the most suitable breed, as being naturally adapted to damp pastures and wet conditions; but even such conditions do not entirely coincide with those of our North Coast, for there is a difference between a hot, damp climate and a cold, bleak, wet one.

Trials on Departmental Farms.

For a number of years prior to 1909 a small flock of Romney Marsh sheep was under observation at Wollongbar Experiment Farm, near Lismore. In 1910 the sheep were very carefully inspected, when it was apparent that very little success had been achieved with them, owing to the unfavourable conditions. "The climate is damp and the herbages are unsuitable," said Mr. Mathews. "Diseases are prevalent, while a still greater drawback to sheep kept under these conditions is the very small rate of increase. This could only be expected, considering the fat and flabby condition of the ewes, due to the succulent nature of the pastures. Furthermore, great trouble has been experienced owing to the prevalence of the bush tick."

It was decided at that time to remove the flock to the drier conditions of Grafton Experiment Farm, and to augment it by the addition of ninety-three ewes from Hawkesbury Agricultural College and a small draft

of ewes privately purchased. Grafton Farm, embracing about 1,300 acres, is of an undulating nature, and the sheep had access to both high lands and flats. They were grazed mainly on the native grasses, and had limited access to artificial pastures, which consisted chiefly of lucerne. The animals were given the best treatment that the conditions would afford. A liberal amount of salt in the form of a lick was made accessible, provision was made for dipping, and to combat worm infestation the sheep were regularly drenched with the ordinary arsenical drench prescribed by the veterinary officers of the Department. Despite all reasonable care in the way of treatment and management, however, the flock failed to make satisfactory progress. The increase was much below the average, and the lambs, after being weaned, appeared stunted, and seemed indisposed to thrive.

In 1914 the manager reported that, with ten years' observation of sheep on the North Coast, he was of opinion that it was doubtful whether Romneys could be kept at a profit in any but small numbers, and that if the same energy and capital were expended on any other class of stock much larger profits would be realised. The flock was again inspected in 1915, but there was no perceptible improvement, despite the fact that it had been rigorously culled and fresh rams introduced at different intervals. The sheep bore evidence of decline, and, although the male stock was allowed to remain entire to a fairly matured age, the sheep were not considered of high enough standard to distribute for breeding purposes.

The following is the text of a final report from the manager, prior to the removal of the flock to more congenial surroundings:—" This experiment has now reached the stage at which further prosecution on similar lines is not warranted. During the whole period under review the sheep have not done as well as was expected; neither from a wool nor from a mutton point of view have they been satisfactory. Compared with all other stock at this farm, the sheep have consistently proved to be the least remunerative. Intestinal and lung worms have been a very irritating source of losses, and scrub ticks have usually carried off a number of the lambs, but the outstanding feature seems to be the general tendency to degenerate, which is no doubt due to the adverse climatic conditions.

" As the land occupied by the sheep can be more profitably utilised, I beg to suggest that the flock be either disposed of or removed to a more suitable locality."

Farmers' Experience.

In addition to the Department's farms, a good many private farmers have kept small flocks of sheep on the coast from time to time, and recently a circular was addressed to a number of them inviting an expression of their experiences. The following paragraphs, which generally confirm the Department's results, have been extracted from their replies:—

From Mullumbimby.—My flock at present consists of one ram, nine ewes, and five lambs, the ewes and lambs being Romney Marsh and crossed. The natural increase is generally from 80 to 100 per cent., but this year, owing to the ewes being fat at mating time, only 50 per cent. of lambs was obtained.

With regard to diseases and the prevalence of worms in sheep here, I am unable to express an opinion, as, apart from the few which I have, I have had no sheep experience. My flock appears to thrive, but foot-rot at times is troublesome, especially in the wet months. However, by keeping the hoofs well trimmed the condition of the sheep does not seem to be affected. They are always fat, even when the paspalum is short."

From Limpinwood.—I have had sheep here for twelve years, starting with about 700 crossbreds, Lincoln x Merino and Romney x Merino, using Romney rams. The first February was a wet season, and worms soon started to kill the sheep. All the sheep appeared to be wormy, and I had recourse to the arsenic drench. The sheep were kept on hilly country, originally scrub, grassed with paspalum mostly, but some clover, couch, and Rhodes grass. I have been running a thousand sheep with about 40 to 50 cattle on 260 acres; but my experience is that sheep cannot be kept successfully in large numbers on the coast lands if confined to small areas. They get smaller and wormy and much lighter in weight, worms being the main drawback. These attack the lambs, and in a wet season it is difficult to keep the latter alive, and under such conditions they are invariably stunted in growth. Scrub ticks also account for a large number of lambs and some grown sheep. Dingoes and dogs also cause a large amount of loss.

Paspalum, in my opinion, is not a good sheep grass. I find that a few sheep, say up to 50 with a run of 150 acres, appear to do well.

From Tyagarah.—I find that sheep do well on the high ground running with cattle, but would not advise anyone to run sheep alone. My sheep, numbering eleven, are crossbreds, and are inclined to get fat. I have had no sign of foot-rot or any other disease.

From Tyagarah.—I have had sheep on this farm for some time, and have always found them to do well, and have never had trouble with fluke or foot-rot. My sheep (sixteen in number) are Romney Marsh crossbreds, and I think this farm is better adapted for sheep than most farms on the coast.

From Condong.—I would not recommend anyone to go in for sheep on a large scale in this district, as in my opinion it would not be profitable. I have forty ewes running on hilly ground, and have not had much trouble with them, as I do not keep the ewes for more than three years, as I find that at that age they are deteriorating. The wool does not grow well, the sheep are fluky, and the lambs do not grow well.

From Terragon, Murwillumbah.—I have had sheep for nine years, but only in a small way—about a dozen ewes—and find that they do well. We have not suffered losses from foot-rot, blow-flies, or anything except dingoes. From my experience, I think they would do well here, the only objection being that in view of the smallness of the holdings it is doubtful if it would pay to wire-net to secure the boundaries.

From Myocum, Byron Bay.—About five years ago I purchased eight crossbred ewes and a Romney Marsh ram. They have reared ten lambs each year, and the lambs are killed each winter for our use on the farm. I have had no losses from lameness, and all sheep killed were sound. The

pastures are paspalum with a red soil hill to camp on, where the grass is always short. I keep a large flock of geese and Indian Runner ducks in the sheep paddock.

Conclusions.

The foregoing reports support the general contention that sheep-raising cannot displace such a thoroughly well-established industry as dairying on the coast. It certainly offers advantages in supplying the household with a very necessary article of diet in the form of home-grown mutton, but beyond this there seems little prospect of the industry being extended in these districts. Even to conduct sheep operations on this small scale, due care must be exercised in the choice of localities. In addition, it is necessary that the flock be kept under constant observation in order to detect the signs or symptoms of diseases to which sheep are prone under such adverse surroundings. The country chosen should be high land with a light soil and its characteristic fine and short grasses.

A comparison of the average rainfalls of various sheep centres with that of the North Coast is interesting, showing, as it does, that in those portions of the State where sheep thrive the best rainfall is usually less than half the rainfall experienced on the North Coast:—

	Inches per annum.		Inches per annum.
Narrandera	17	Glen Innes	31
Lockhart	18	Grafton	35
Cooma	19	Lismore	50
Wellington	22	Murwillumbah	66
Yass	24	Tweed Heads	65
Wagga	21	Ballina	62
Grenfell	24	Byron Bay	76

It is evident that paspalum as a sole article of diet is unsuitable for sheep. They become fat and flabby, and exhibit great distress at the least possible exertion. At its best, sheep-raising can only be viewed as a side-line in this district, and where the richer flats lie in proximity to sloping ground, a flock may be maintained to greater advantage if the food supply be augmented by the growth of some nourishing form of crop that is relished by sheep. If a flock is to be retained permanently fresh blood will be necessary from time to time to maintain the virility of the breeding stock and to reinvigorate the strain. On the other hand, if sheep are merely brought to the district for fattening, care must be taken to see that they are as free as possible from disease.

Of all breeds, the Romney Marsh is undoubtedly the most suitable of those so far known for the North Coast. Effective measures, however, will always be required to restrain the prevalence of disease so common to the locality. In the first place, as indicated by Mr. Mathews, the sheep should always have access to a plentiful supply of salt in the form of a lick. They should as far as possible be kept away from all stagnant pools where the land is not effectively drained, and above all regular and systematic drenching should be carried out. Worm troubles are usually indicated by a debilitated appearance and pallidness of skin. The presence of fluke, which is also likely to be prevalent under such conditions, is usually revealed by yellowness about the inner part of the eye, on the tongue, around the gums,

and more or less over the roof of the mouth. Prompt fattening, prior to rapid and serious decline, is further evidence of the ravages of this disease. External treatment is of little avail in the case of fluke. Affected sheep should be immediately removed to higher lands and more nourishing feed.

Treatment for Worms.

Ordinary intestinal and stomach worms may be dislodged by the administration of drenches prepared from 1 oz. arsenic, 2 oz. washing soda, and 1½ gallon water. The arsenic and washing soda should be boiled for half an hour in ½ gallon of water, and then sufficient water added to bring the quantity up to 1½ gallon. The mixture should be given time to settle, the liquid content poured off, and the remaining sediment disposed of by burying. The first drench should be given about the middle of February, and the treatment renewed at monthly intervals to the middle of April. This is the period of the year at which flocks seem to be most effected.

To effectually administer the drench the animal should be placed firmly on its four legs. It should be handled as quietly as possible, and on no account should violence be used. The dose should be given when the paunch is empty, and for this reason the sheep should be placed in an enclosure where they will receive neither food nor water for about fifteen hours prior to administering the drench. To get the best result from the treatment prescribed, about six hours should be allowed to elapse after the administration of the drench before the sheep are released. They should then be put on a fresh crop of succulent feed, such as rape, barley, &c., or, if this is not available, upon a field of natural pasture that has been kept in special reserve. The quantities to be given are as follows:—Young sheep (weaners), 1 fluid oz.; older sheep, up to 1½ oz. A proper drenching horn designed to the right quantities should be used for the purpose.

Dipping.

It is necessary also to dip the sheep regularly at from one month to six weeks after shearing. Where the flock is not sufficiently large to warrant the outlay and expenditure of a properly constructed excavated dip, a small dipping bath may be used. It is advisable always to use a reputable proprietary preparation, and to pay due heed to the directions given as to the prescribed strengths and method of application.

The question of shearing is one for consideration in districts of such high rainfall as those on the North Coast. The object should be to have sheep as free as possible from wool during the period when the rainfall is most excessive, and for this reason it is advocated that the sheep be shorn twice during the year—late in spring and again just before winter finally sets in. Probably there are those who will disagree with this practice, contending that it will detract from the value of the wool by reducing the standard length of staple. It should, however, be borne in mind that the sheep are being kept under somewhat extraordinary conditions, and the value of the fleece is only of secondary importance. The sheep are kept primarily for mutton for local consumption, and the health and stamina of the flock should precede all other considerations.

Diseases of Sheep.

Internal Parasites.

H. G. BELSCHNER, B.V.Sc., Government Veterinary Surgeon.

THE NODULAR WORM (*Oesophagostomum columbianum*).

This is the worm responsible for the condition called nodular disease of the intestines, or what is more commonly known as pimply or knotty gut. The nodular worm (*Oesophagostomum columbianum*) is a thin, thread-like worm, found in the intestines, but at certain stages of its life it also invades the intestinal wall and causes the formation therein of small, rounded nodules. Occasionally the larval worms find their way to the mesenteric lymphatic glands, the omentum, or liver, and form small nodules. The nodules are most numerous in the wall of the large intestine, and are more common in old sheep, although young lambs may be affected. The adult female worm is about half an inch long, and the male is a little shorter.

Life History.

The eggs are passed out in the fæces; they hatch out between the seventh and twentieth hour and commence the larval period. Further development depends on weather conditions. The outer skin of the larva acts as a protection against adverse weather conditions in the open before it is swallowed by the host (sheep). When the mature larvæ are swallowed by the sheep they follow the stream of ingesta through the stomach and intestines as far as the large colon, shedding the outer skin on the way and migrating into the mucosa of the colon very soon after arrival. A further metamorphosis takes place here, and about the fifth or sixth day the larvæ migrate from their cysts into the lumen of the intestine, frequently adhering to the mucosa, and protected by a coat of mucous and catarrhal secretion. They remain in the intestine (cæcum, colon, and portion of the small colon) and develop into the mature worms. This is stated to take place about one month after the sheep is infested. It is in the intestine that the mature worm lays her eggs.

Effect and Symptoms.

The symptoms of nodular disease are as a rule not very characteristic during life, but where there is severe infestation the symptoms resemble those seen in other parasitic troubles—paleness of the mucous membranes of the eyelids, emaciation, dry wool, &c. Excessive diarrhœa may occur while the parasite is still in the larval stage, and many of the larvæ may be passed out in the fluid fæces.

After the emergence of the larva from the cyst in the mucosa of the bowel wall, the cyst may heal up without leaving any trace to the naked eye. The caseous and calcareous nodules usually seen at post-mortem of infected sheep are therefore apparently the result of necrotic or bacterial complications following cystic ulceration. The cause of death in sheep

heavily infested may be due to the presence of the calcareous nodules in such large numbers as to interfere with the process of absorption. The harm done by the nodules is directly dependent upon the number present.

Treatment.

There is no satisfactory method of treatment. No medicine given internally can reach the nodules, and even the adult worms in the large intestines are difficult to destroy. The ordinary worm drenches may have some effect in this direction.

Prevention.

Change of pasture as advised for other internal parasites, maintenance of health and condition of the sheep by ample supply of food, and the provision in the paddocks of a suitable salt-lick are the preventive measures recommended. Where certain paddocks are known to be badly infected, sheep and cattle should be removed for twelve months if practicable.

TAPEWORMS.

The tapeworm most commonly found infesting sheep in this country is *Moniezia expansa*. This worm lives in the small intestine, and attains a length of 15 feet or more. Young lambs are chiefly infested, generally in the autumn; as many as ten or more tapeworms may be found in a single lamb. The worm is white and flat in appearance and made up of individual segments, which are broader than they are long. Each segment develops a complete set of reproductive organs. The last segments, which contain many eggs, break off from the rest of the body and are passed out in the fæces. These segments can be readily seen in the fæces and serve to diagnose the presence of the parasite.

As nothing is yet known of the cystic form and intermediary host, the life history has not been determined.

Effect and Symptoms.

Generally speaking, tapeworms are not responsible for great mortality among sheep in this country. When lambs are heavily infested the mechanical obstruction caused by the presence of the worms and the irritation set up interferes seriously with the health of the animal. The symptoms exhibited are a falling-away in condition, and frequently diarrhœa.

Treatment.

The common copper sulphate or arsenical drenches as recommended for stomach worms are also effective for tapeworms. Other recognised vermifuges are kamala in ½ to 1 drachm doses, mixed with linseed gruel; powdered areca nut, 1 to 2 drachm doses, according to weight, given in bran which has been damped, or in molasses and water; oleoresin of male fern, 1 drachm, combined with 2 to 4 ounces of castor oil. It is advisable to follow up any treatment for tapeworms which does not include a purgative by the administration the following day of a medicine to clear the bowels.

Two ounces of epsom salts dissolved in warm water will be found useful for this purpose.

Prevention.

Nothing definite can be said as to prevention, owing to the life history of the parasite being unknown. Over-stocking should be avoided, and the condition of the sheep maintained by the provision of good feed and water, and the general preventive measures as laid down for other internal parasites observed.

LUNG WORMS.

There are two species of lung-worms which infest sheep in this State, viz.: (1) *Dictyocaulus filaria* (*Strongylus filaria*) and (2) *Synthetocaulus rufescens* (*Strongylus rufescens*). Of these the former (*Dictyocaulus filaria*) is probably the more common, and is the one that mainly infests the bronchi of young lambs, causing verminous bronchitis. This worm is white in colour, and thread-like, measuring 1 to 4 inches in length, the female being the larger. The eggs contain developed embryos, which are liberated in the bronchi as the eggs are deposited. The worms may be seen by cutting open the trachea (windpipe) and bronchi of infected dead sheep, where they will be found, according to the severity of the infestation, coiled about each other and covered with muscous thrown off as a result of the irritation set up by their presence.

Synthetocaulus rufescens, commonly called the "hair lung-worm," is much smaller than *Dictyocaulus filaria* (thread lung-worm). The worm is thin and hair-like, brownish-red in colour, and measures ⅝ to 1½ inches long, the female being slightly larger than the male. The embryos develop soon after the eggs are deposited, being liberated in the small bronchioles and pulmonary alveoli (lung substance). This worm is therefore not confined to the bronchi, but penetrates right into the substance of the lung, causing the formation of small nodules, varying from the size of a mustard seed to that of a pea, and containing a certain amount of gritty, greenish pus.

The hair lung-worm is chiefly responsible for the disease called verminous pneumonia.

Life History.

The complete life history of the lung-worm is not definitely known. The newly-hatched larvæ are expelled from the sheep in coughing, or are swallowed and passed in the fæces. The larva undergoes several moults during the course of the next few days, depending upon moisture and temperature. Under normal conditions, the larva becomes infective in from six to ten days, when it climbs up blades of grass when they are wet, or remains in water for a considerable time, and so is taken in by the sheep again. The final stage of the larval form, before it reaches the host, is very resistant to adverse conditions. The larval worms reach the lungs probably by way of the blood stream, where they mature in from a month to six weeks from the time they are taken in by the sheep.

Effect and Symptoms.

The symptoms of lung-worm infestation may develop at almost any time of the year, but more particularly during late autumn and winter and early spring, disappearing to a great extent from the sheep on the approach of summer. The most prominent symptom is a characteristic irritating cough, with a discharge of much mucous from the nostrils and sometimes from the mouth. In addition, sheep, when badly infested, show all the general appearances of emaciation, anæmia, &c., associated with parasitic infestation. Lung-worms are seldom found alone, but are usually accompanied by stomach worms. Death may result from poverty and exhaustion, or sheep may die from suffocation due to the accumulated masses of worms and mucous blocking up the air-tubules. The hair lung-worm (*Synthetocaulus rufescens*) does not cause the same distress as the thread lung-worm (*Dictyocaulus filaria*), but it may cause pneumonia. This will depend upon the number of worms present. Occasionally, when infestation is heavy, severe mortality occurs.

Treatment.

Treatment aimed at attacking the worms by way of the digestive tract with drugs supposed to act by their excretion through the lungs has not been very efficacious. It has been pointed out that sheep suffering from lung-worm are usually also infested with stomach worms, so that a drench given for worms will as a rule expel the stomach worms to a great extent. The sheep, thus relieved of one of its two enemies, naturally does better and improves in condition, but the lung-worm remains untouched. Fumigation with fumes of sulphur has been recommended and widely practised, particularly with small flocks. Considerable care must be exercised, as the animals are subjected to the fumes until they are dangerously close to asphyxiation. The method is as follows:—About fifty sheep at a time are placed in a tightly-closed building with low roof or in a tent. Masses of sulphur, or mixed sulphur and tar, are placed on pieces of tin or iron, or in a pot suspended by a chain from the ceiling, and so protected that there is no danger of fire. These are then lighted and the sheep exposed to the fumes. In a few minutes severe coughing will result, and treatment should not last for more than five to ten minutes. During the fumigation the animals should be carefully watched for evidences of asphyxiation. Fumigation should be repeated in two or three weeks, and if necessary a month or two later. The operation should not be carried out in cold, windy weather.

A more successful method of treatment, but one requiring a certain amount of skill in administration and really only suitable for small flocks, is the intra-tracheal injection of liquids which will kill the worms or reduce their vitality in such a degree that they may be easily expelled. There are a number of formulæ for intra-tracheal injections. The following is recommended:—Oil of turpentine, 20 drops; oil of creosote, 10 drops; chloroform, 10 drops; olive oil, 1 drachm. This is a dose for a grown sheep, and may be decreased by one-third for lambs. The injection is given slowly directly

into the windpipe, about half-way down the neck, with a special syringe with a curved needle or an ordinary hypodermic syringe. Severe coughing generally occurs. Three or four injections are necessary at daily intervals.

Prevention.

Generally speaking, the only efficacious method of combating lung-worm in large flocks lies in prevention. The precautions that apply to stomach worm should be observed here. It is very important that the sheep receive a plentiful supply of nourishing food, so that the bodily resistance of the animals may be increased. Rotation of pastures is strongly recommended, and where possible sheep should have access to a sheltered paddock in the winter. Special care should be observed with young sheep, and if newly purchased they should not be allowed to pasture on paddocks recently occupied by lung-worm-infested sheep.

ANOTHER STOMACH WORM.

Trichostrongylus extenuatus (*Strongylus cervicornis*).

This is still another very small parasitic worm, chiefly in the fourth stomach of the sheep. Being much smaller than the stomach worm, *Haemonchus contortus,* it is frequently missed at post-mortems of lambs that have succumbed to the effects of parasitic gastro-enteritis. The worms may be detected by taking a thin scraping from the lining membrane of the stomach and smearing it thinly upon a piece of glass and holding it up to the light, or by placing the scraping in clean water in a flat-bottomed dish.

McFadyen states that "when taken from the stomach of an animal recently dead, the worms display active movements, but when putrefaction of the carcase sets in they soon die and shrivel up. In the perfectly fresh stomach they are generally most numerous on the lining membrane, but even then they may be present in hundreds in the liquid contents, and can be easily overlooked if the person making the post-mortem relies upon the naked eye inspection of the fourth stomach and its contents."

The life history has not been worked out, but it is probably similar to that of *Haemonchus contortus.*

Treatment.

Treatment is the same as for *Haemonchus contortus,* i.e., copper sulphate or arsenical drench, but special care must be exercised as to dosage and repeating the drench at intervals, as these worms are more difficult to remove. It may be taken as a general axiom that the smaller the parasite the greater trouble it is.

In America this parasite has resulted in heavy mortality among sheep, up to 30 per cent., when *Haemonchus contortus* was not found to be present at all. It would appear that it is also responsible for a good deal of mortality among sheep in this State, especially among lambs, and is frequently associated with the more common stomach worm.

The general preventive measures already outlined will also apply here.

Deleterious Substances in Wool.

F. B. HINTON, Sheep and Wool Expert.

At a recent meeting of the General Council of the Graziers' Association of New South Wales, information was given by Mr. J. H. C. Hodgson, of the Bradford Chamber of Commerce, as to the damage caused to wool through the presence of deleterious substances used in branding, and the admixture of jute fibres from the bales. According to Mr. Hodgson, very considerable loss was caused to manufacturers by the deleterious colouring matter referred to, and his Chamber had been unable to ascertain which clips were responsible, but he supplied some samples of hat felting which had been made from a blending of Australian and New Zealand wools. These were subsequently submitted to the Department for analysis, if possible, of the staining agent, together with a sample of cloth containing certain fibres that had not accepted the dye, and that were thought by the Chamber to be jute. In the opinion of some members of the Association they consisted partially of kemps.

The small amount of the substance available, and the fact that the material had undergone so many manufacturing processes, made it impossible to determine definitely the cause of the stains, which, however, in the opinion of Mr. A. A. Ramsay (Chemist) and of the writer, were probably due to tar. The fibres which had failed to take the dye in the other sample were found to consist only of jute.

Following a conference between representatives of the Association and interested departmental officers, a summary of the general opinions formed as a result of the inquiry and discussion was addressed by the Department to the Association. The following paragraphs present the facts:—

It is a well-known fact that coal-tar and bluestone have a damaging effect on wool, and may cause loss to the manufacturer, but the buyer of the wool makes a standard allowance to cover the possibility of the presence of these substances. Various specifics are in use for blowfly and for the wounds caused during shearing, and in the absence of a specific which would be efficacious against blowfly, curative in the case of wounds, non-injurious to the physical structure of the wool fibre, and at the same time capable of scouring out perfectly white, there is little hope of remedying the trouble. In cases of serious blowfly attack, the sheepowner will bring into use any specific which he considers of value, and it would be well nigh impossible to prevent a grazier or farmer from using a substance which experience has proved to be effective. The suggestion has been made that the Department should experiment with the different proprietary blowfly and sheep-branding specifics, with a view to finding which were likely to cause stains in the manufactured article, but such investigations would scarcely be practicable in view of the number of specifics, sheep-branding oils and other materials for use on the skin of a sheep which are on the

market. Chemical changes are taking place in these different specifics at every stage of their exposure to the weather and throughout the course of the manufacture of the wool, and it would be impossible to carry out comprehensive tests of all. The objective to be aimed at lies in the direction of a specific possessing the four qualities mentioned, and it is in this direction that the Department's activities are tending, and in which it is hoped eventually to meet with success.

Where a line of wool with an identifiable brand (i.e., on the wool pack) can be shown to have produced a manufactured article whereon stains are present, every effort will be made by the Department to discover the type of sheep-marking oil or other fluid which the owner of the brand has used.

The presence of jute in the finished article is a subject that has exercised the minds of all bodies interested in the various ramifications of the sheep industry. The most effective way to overcome the difficulty would apparently lie in the adoption of a different material for use as a covering in which to market wool. This is a subject that is at present being dealt with by the Bradford Chamber of Commerce, and the various organisations that are marketing the Australian clip and clips from other countries.

Essential for Economic Feeding.

One cannot over-emphasise the fact that systematic management and feeding of a herd is essentially dependent on milk recording.

Without some system of recording it is impossible to feed according to yield. It enables us to weed out poor milkers, discard the unprofitable cows, and breed only from those whose yield justifies their presence in the dairy herd.—R. Boutflour, in the *Scottish Journal of Agriculture.*

"The Pig Breeders' Annual, 1925."

"The pig industry of Great Britain has been making great advances since the war ceased. Our pig population has made its first definite growth for the last half-century; everywhere among pig-keepers we find activity and interest in breeding, in feeding and in management. We are moving forward, and my purpose here is only to suggest that the two ends we should constantly keep in view are uniformity of output and collective marketing." Thus the Right Hon. E. F. L. Wood, British Minister of Agriculture in a foreword to *The Pig-breeders' Annual* for 1925, a copy of which reaches us from the National Pig-breeders' Association, London.

The annual, which makes about 110 pages, presents a collection of excellent articles, of which perhaps the most interesting to the Australian reader will be "The Value of Accounts to Pig-keepers," "The Nutrition of the Pig," and "The Cause, Effect, and Cure of Pig Diseases," but the reference portion of the book once more contains tables of value to all pig-breeders.

Co-operative Enterprise at Batlow.

What Fruitgrowers Have Done.

W. H. BROWN, Editor of Publications.

How low prices will fall upon the appearance on the market of large supplies of any class of fruit, and how quickly they will recover to a profitable level when the bulk of the crop has been disposed of, is an oft-told tale of which growers can give many variations. Impressed by such experiences, there are many orchardists in the State who are just now inquiring the way by which the periods of over-supply, colloquially known as "gluts," may be prevented, and the marketing of fruit that might otherwise be quite profitable, be distributed over a reasonable period. As a matter of fact, these periods of over-supply, while a serious source of loss to the grower, are not of corresponding value to the consumer, to whom any advantage they might afford is generally denied by large quantities of medium to inferior quality fruit being destroyed, in order that a limited quantity may be offered for sale at prices satisfactory to those through whose hands it has to pass.

The present season afforded a glaring example in the sudden and ruinous decline in the price of London Pippin (Five Crown) immediately after Easter. A substantial part of the whole crop of that variety must have come upon the market within a very short time, with the inevitable result. Only a few weeks later prices had so recovered that what had only been worth 6s. or 7s. was bringing over 10s. The profit attaching to some inexpensive method of holding a quantity of apples for a couple of months under such conditions is obvious.

The Victorian growers, confronted no doubt by a similar state of affairs in years gone by, have largely solved the problem by the erection of cool stores, in which fruit can be held until it is desirable to market it. That the system has been a success could not have better proof than in the fact that in that State every fruit district of note to-day has its cool store, which as a rule is co-operatively owned. The storage capacity available for fruit in Victoria can accommodate about 1,500,000 cases, over two-thirds of that storage being available within the fruit districts, and under the close control of the growers themselves. In New South Wales, on the other hand, no storage at all exists, except a small capacity in proprietary stores in Sydney, and that provided at Batlow within the last two or three years as a result of local enterprise.

THE COOL STORE.

It was in the year 1922 that the Batlow Co-operative Cool Store Company, Limited, came into existence as a result of a desire to reduce the serious losses referred to above, and of the visit of a couple of local growers to Victoria with the specific object of collecting data on behalf of themselves and their neighbours.

The raising of the necessary capital was an inevitable limitation, but the Rural Bank was approached, and encouraged by a sympathetic reception the company was formed, strictly on co-operative lines and limited to growers in the district. The nominal capital was fixed at £15,000, and as it was anticipated that the cost of construction would work out at a little less than 15s. for space for each case, the capital was divided into 20,000 shares of 15s. each, it being an essential of the whole scheme that each shareholder should become an absolute owner of space in the same proportion as he took up capital. It is satisfactory to be able to record that the cost of construction was well within the estimate, the first three chambers being erected at a little under the 15s. per case-space, while later storage has only cost about 10s. per case-space, no additional outlay for engine and refrigerating machinery being necessary. The average cost so far has therefore been 12s. 6d. per case-space. The railway siding represented an additional 3d. per case-space.

On the first issue of shares, 4s. per share was called up, and the same on the second issue of shares a few months later in view of additional accommodation, but in certain further developments now contemplated 5s. per share of new capital will be called up in order to "even things up," the shares previously issued now having a cash transfer value of 5s. per share.

As site, the directors were fortunate in procuring an area close to the spot where the railway station and yards were ultimately to be (and where they now are), and the erection of a fully-equipped cool store with a capacity for 8,000 cases, divided into three storage chambers, was completed in time for the 1923 crop.

Shares to the number of 8,000 were applied for and issued, the 4s. per share mentioned being called up. The balance of the necessary capital, £4,500, was advanced by the Rural Bank. Later on when extensions were undertaken the loan was increased to £6,630, on the security of the uncalled capital, the land and buildings, and of a guarantee from each shareholder of 10s. per share. With regard to the last item in the Bank's security, it may be explained that a "joint and several" was at first suggested, but the guarantee was a later idea, and the fact that shareholders assumed such a responsibility and undertook the added liability is a notable evidence of their confidence in the venture and of their determination that it should have a successful issue. If, as the commercial success of the innovation becomes apparent, the Batlow people's move becomes an example to other fruit-growing districts in the State, the twenty-three original Batlow shareholders will have the satisfaction of knowing that their enterprise and confidence have been of the greatest importance to the whole industry, and the additional liability they assumed at the outset will then acquire the greater significance.

The amount of space first provided—8,000 cases—was, of course, small—almost insignificant compared with the crop—but inasmuch as it is possible for the storage space to be used for two or three lots of fruit in a season,

it was rather more important than appears at first sight. In the very first year, the store was an unqualified success, and growers made an appreciable profit—not in the operation of the store itself, for it is not conducted for dividends—but in the enhanced prices obtained by holding fruit for a few weeks.

Before the end of the first year, the erection of two more chambers was decided upon, increasing the storage capacity to 14,400 cases. Nor has the forward movement reached its end even yet, for the Batlow people are at the present time considering the erection of three further chambers which will bring the total capacity to 23,000 cases.

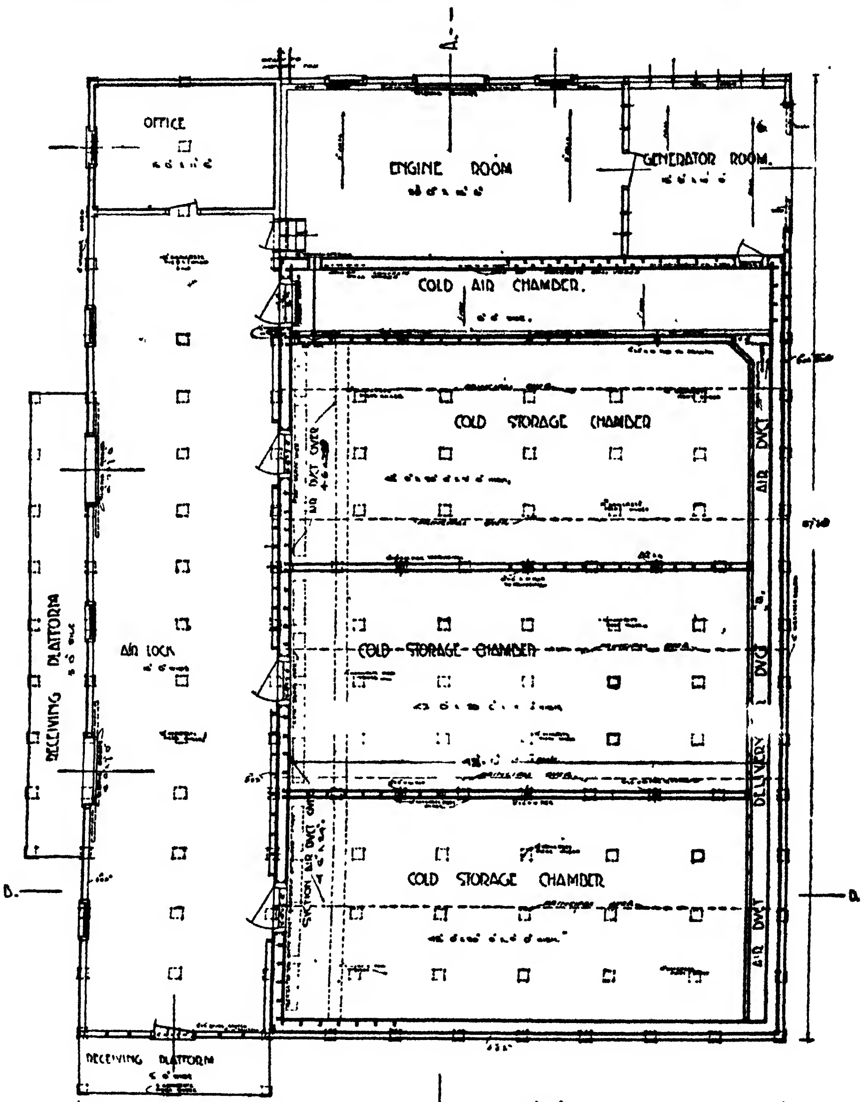
Batlow Cool Store under Cool Conditions.

Batlow's Considered Opinion.

In these circumstances it hardly need be said that most Batlow growers are now confirmed advocates of cold storage as a method of preventing loss by excessive forwardings of fruit at any one time, and Mr. N. H. Case, the Chairman of the company, speaking quite recently, said, "We can now give it as our considered opinion that there is urgent need for the erection of similar stores in the other apple and pear districts of the State. We are interested in other districts doing as we have done, because they also produce large quantities of fruit which also have to be put on the market within a limited period, causing serious losses compared with the prices that could be obtained were supplies distributed over longer periods. Even with cool storage," he added, "there are bound to be periods of full or of over-supply, because after all cool stores can only take part of the product. But if there were a chain of such stores in the fruit districts of the State, not only would the producers be in a better position, but consumers would be able to get fruit during nearly the whole of the year. The wasteful system of gluts is of no real advantage to any one."

How it Works.

As indicated above, the allocation of the shares in the company was on the basis of one share for each case-space the shareholder desired to have.

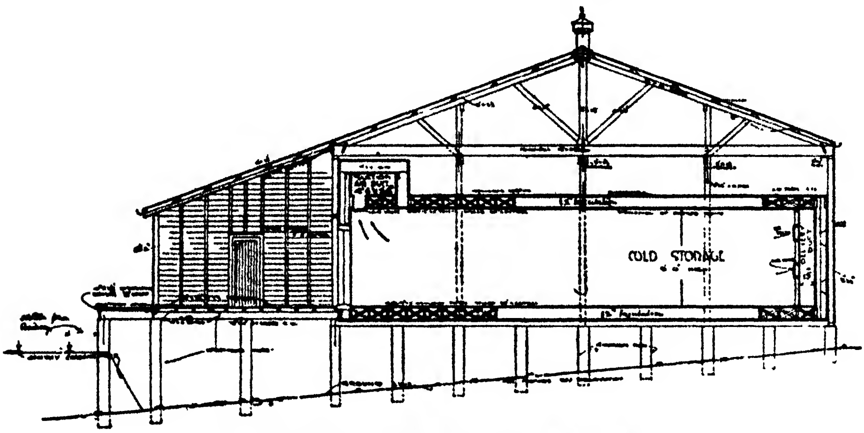


Ground Floor Plan of Batlow Cool Store.
Reduced from the plans for the original three cold storage chambers.

Thus if a shareholder wanted space for 500 bushel cases, he applied for 500 shares. As a matter of fact, the amount of space taken varied greatly. One grower, for instance, has shares entitling him to space

for 2,000 bushel cases, while a lady is entitled to space for a modest 50 cases. But large or small, each shareholder is the absolute owner of his space, and is entitled to change the fruit in his particular portion of the store as often as he wishes, or to sub-let space if he so prefers. The shares are not negotiable, except with the approval of the directors, it being expressly intended that the co-operative character of the concern shall be preserved for the benefit of growers. Only in one case has a transfer of shares been sought, and that was a shareholder who was leaving the district.

Owners of space themselves do all the handling in and out of the cool chambers, the company's only service being the supply of cool storage. For convenience it has more recently been arranged that when a grower is taking fruit out of the cool store with a view to having it graded, packed, and forwarded by the packing shed which adjoins, the actual removal of the fruit from cool store is done by the packing shed staff at a charge of



Section on the Line B—B, in the Ground Plan.

three-farthings per case, but under all other circumstances the handling in and out of the cool store is done by the owner of the fruit. These operations are performed under the supervision of the engineer in charge of the store, and it is found necessary to insist that fruit that is being put into the chambers shall go in comparatively early in the day, especially in the hot weather when the lowering of the temperature of the room and of the fruit after a large quantity has been put in might increase labour and other charges.

To cover working expenses, interest charges, depreciation, and repayment of the Rural Bank's advance (which is at a fixed rate per year), a charge of 2s. 6d. per annum is made for each case space, payable in five installments of sixpence each distributed over the twelve months.

Some Details of the Store.

In view of the interest other districts are manifesting in this subject of cold storage, the accompanying plan used in the construction of the first

portion of the store, together with a few details about the building and its operation, are likely to be of interest. The plan presents only three chambers, but the reader will find no difficulty in imagining the two additional chambers erected at the right hand side in 1923-24 as identical in all respects to the first three.

The operating plant consists of one 28-32 b.h.p. Hornsby suction-gas engine, which consumes either coke or charcoal as fuel, the former being distinctly the cheaper, though the latter is rather the more satisfactory in other respects. This engine drives the 10-ton Linde ammonia compressor by which the temperature in the five storage chambers is lowered.

The storage chambers are each 42 feet long, 20 feet broad, and 9 feet high, the outer walls consisting of 6-inch weather boards, with a 12-inch insulation consisting of shavings or "buzzer chips" rammed tight between triple lining boards. This insulation is carried over ceilings and under floors, so that there is complete protection against external temperatures, though between chambers the insulation is only 9 inches thick. The walls and floors are carried on concrete piers, and the roof consists of corrugated iron.

The system of refrigeration employed is that known as the "dry air" system, the air being cooled by being passed through the "battery," which really consists of an insulated room in which are the coils of pipes containing the compressed ammonia. A large suction fan draws the warmer air from the storage chambers through an overhead air duct into the "battery," where contact with the coils of pipes reduces its temperature as it passes toward a delivery duct along the far side of the storage chambers by which it is conducted (now much colder than when it entered the "battery") back into the rooms. Thus the cooling of the fruit depends upon the circulation of air by the suction fan through the whole of the chambers, in the course of which circulation it is regularly brought into contact with the coils of cold pipes. It may be remarked that the system of refrigeration known as "direct expansion" is generally cheaper to run than the "dry air" system, but the latter has its recommendations, and is particularly suited to handling fruit.

So efficient is the plant that even when fruit is being received freely in hot weather twelve hours running is sufficient for the reduction of the temperature of the storage chambers and the fruit to 32 degrees, while in cooler weather with somewhat less fruit going in and out, eight hours running is sufficient to keep temperatures down to the desired level.

The temperature actually desired ranges quite narrowly round 32 degrees, it being injurious to freeze the fruit on the one hand, and necessary to keep it cool enough to prevent depreciation on the other hand.

As stated above, the total capacity of the store with the present five chambers is 14,400 cases, but fruit is continually going in and out. Last year about 28,000 cases were put through, which means that the space was used about twice. Beginning early this season with considerable quantities of pears, a much larger turnover is expected. Some 23,000

cases had been put through the store by the end of April, and 13,500 cases were actually in the chambers at that time. It is anticipated that by the end of the year approximately 50,000 cases will have been handled in and out. As this is practically the maximum that can be expected of such a store (the space being used rather over three times in a season of ten months), appreciation of the utility of the store is evidently increasing. When it is remembered that in a normal season 200,000 cases of apples and pears will be produced in the Batlow district, it is apparent that even with the increase of storage capacity to 23,000 cases, the accommodation will not be excessive.

As a rule, the fruit is placed in cool store in the cases into which it was packed in the orchard, though occasionally a shareholder has a lot graded and packed in the adjoining shed of the Co-operative Packing Company, and then places it in cool store to await the day when it shall be marketed.

The floor of each chamber is marked off according to the amount of space owned by each shareholder, every man having and knowing his own block of space. Each must observe strictly his own boundaries, the centre 30-inch track of each chamber being kept clear, and the whole floor clean. So that there shall be a complete circulation of air, the stacks must be placed with a half-inch of space all around each case, and a clearance of not less than 9 inches must be left between the top of the stack and the ceiling.

Outside the chambers and between them and the railway siding is a large covered-in platform, somewhat euphemistically called an "air lock." This affords ample space for the handling of fruit, and in fact is so commodious that before the packing shed was erected, shareholders who were withdrawing fruit from the chambers used it for grading and packing their produce prior to loading it for market. Gravity runaway conveyors and trolleys of modern types are provided to enable shareholders to handle their crops with greater ease.

As Mr. H. V. Smith, one of the active spirits of the concern, pointed out, the cool store is not a profit concern. The rent of 2s. 6d. per case-space, charged for running and other costs, is just sufficient to cover actual requirements. In the first year of operations, with a revenue of £400 from rents, there was a small profit, but in the following year, with more space available and a longer operating period, and rents totalling £1,321, there was a trifling loss, owing to depreciation and other charges being fixed at what must be regarded as a very safe rate. The object of the store is to provide the members with the facilities for holding their fruit for better prices, and considering that for cool storage in Sydney 3½d. per case for the first week and 1½d. for each subsequent week is charged, the rental of 2s. 6d. per case-space per annum may be considered very satisfactory indeed. In fact, the actual internal operating costs are only 1s. 1d.—a very encouraging circumstance to other fruit districts. For this small sum the marketing period for fruit that ordinarily would have to be sold within a short

time is extended to nearly ten months, it being usual to start refrigerating early in February, and to continue until about the beginning of December. The remaining 1s. 5d. per case-space goes toward the repayment of the loan, depreciation, and similar charges.

Some Cold Storage Experience.

A good deal of experience has been gained in the past three seasons, of course, as to the incidence of cold storage in relation to fruit. In the first season a good deal of "scald" (a condition associated with cool storage of fruit in different parts of the world) occurred among Granny Smith apples, and in consequence a series of experiments was arranged in the 1924 season with the object of ascertaining whether oiled paper, which has given good protection elsewhere, would be satisfactory here. Several cases of Granny Smiths from different growers were placed under observation, the fruit in one being without wrappers of any kind, that in the second being in ordinary wrapping paper, that in the third having oiled wrapping paper that had been made in Melbourne, and the fruit in a fourth being in an oiled wrapping paper from America.

The four cases were withdrawn on 9th December, and on inspection ten days after the apples wrapped in the oiled wraps presented a much brighter and more attractive appearance than those in ordinary wraps and those without wraps. The unwrapped apples and those in ordinary paper were unsaleable or practically unsaleable six days after they were removed from the store, but ten days after removal from store the apples from the oiled wraps, except for a few unsound specimens, were to all appearances as good as when first taken out of cool store.

The experiment was confirmed by experience with commercial parcels of Granny Smith apples, totalling 1,200 bushel cases, which were stored in oiled wraps from the end of June or early July till October, November, and December in the same season. In this case also the Victorian wraps were found quite as satisfactory as the American. As a result, oiled wrappers are likely to be largely used this year, some of them even on London Pippins (or Five Crowns).

In Victoria trouble has also been experienced with scald among Jonathans, but none of it has occurred at Batlow, though so far the number of that variety stored there has not been large. London Pippin has kept well until September and October, and in view of the large quantities of that favourite variety which come on the market at one time, depressing the price, storing them is distinctly profitable. In the 1923 season London Pippins were sold in March and April at 5s. and 6s. per case, but in September and October the price was 10s. to 15s. per case—a handsome profit for any who could participate in it.

Delicious, though not largely grown at Batlow, has shown in two seasons that it retains flavour and comes out of store in good condition, selling at very high prices in October and November.

Doherty, Yates, and Crofton all store well, and a few Rome Beautys have been stored successfully.

It has been found that fruit that is to go into cool store should be mature, though not quite so ripe as for eating. The ground colour should have slightly changed from green to light yellow when the fruit is picked.

Most varieties should be put into cool store quite early after picking, but experience suggests strongly that Granny Smith is best kept in ordinary storage for three months before being put into cool store. This is rather an advantage, for it enables other fruit to be held in the cool store until, say, July, when it can be profitably marketed, while the "Grannies" (which might even be held in ordinary storage until September or October) can then be put into the cool store and held until quite late in the year.

Somewhat similar remarks might be made as to the time at which pears should be picked. They also should be allowed to hang until the ground colour has just changed. Varieties like Winter Cole, Josephine and Packham's Triumph store well. Howell shows a tendency for the skin to go black after being removed from the cool store, though it keeps better if not put into the cool store until well matured. Williams was stored largely one year, but not with a great deal of success. However, provided the fruit is well picked there is undoubtedly profit in keeping this variety under cool store conditions for a short period.

In addition to care in determining the picking time for fruit that is to go into cool store, carelessness in handling is responsible for considerable decay in stored fruit. Freedom from bruises and skin abrasions is fundamental to successful storage. Poorly developed, imperfect, and injured fruit should not find place in the storage lots. It is here that growers see an advantage in grading fruit before it is placed in store.

Large fruit does not usually store well; 3-inch apples of most varieties are apt to depreciate quickly after removal from the cool chambers. For maximum success the conditions should be normal in all respects as far as possible. It has been observed, for instance, that fruit raised in a very wet season does not store too well, and though this is beyond the control of the orchardist, it will certainly suggest that good cultural methods, such as reduce the effects of untoward conditions, favour good results with cool storing.

Prompt storage after picking is desirable with most varieties. Delay at that stage reduces the life of the fruit, allowing for more rapid ripening, and also favours the development of scald. Careful handling between the tree and the store was found to be most important in certain New Zealand experiments.

A Cool Store Programme.

The grower who stores fruit should work to a consistent programme. The profit lies in holding one class of fruit just long enough to catch improved prices, and at the same time to allow of other fruit being put into cold store while it is still in prime condition, so that it too may also presently realise top prices.

An orchardist may, for instance, place Williams pears in the chambers in February and March, and hold them there until prices have moved up, say 1s. or 1s. 6d. per case. The Williams may then be replaced by Winter Cole pears, Packham's Triumph or Josephine, which would go into store during the latter end of March or in April. In 1923 Winter Cole pears sold in Sydney during March, April and the early part of May at 6s. to 10s. per bushel case. By June and July these same pears from Batlow were bringing 10s. to 14s. in Sydney, and 15s. to 18s. in Brisbane. The pears being withdrawn from the chambers, their place might be taken by such a variety of apple as London Pippin, which, if held till September, would show a good profit. By that time, or a bit earlier, Granny Smiths could take the place of the softer variety, and the year would thus fill up profitably, for the "Grannies" could be kept until the end of November, and would even market near Christmas. For long storage, however, London Pippin must be placed in store soon after picking; if this is done the grower will find he can hold until October and November and make a still better profit on them, while the "Grannies" would quite well keep in ordinary store until October and yield a good enough profit. In this case only two fruits—the Williams pears and the London Pippin apples—would occupy the store space, but a good profit would be shown on the latter with the possibility of a fair profit on the former. Most growers, however, prefer to store "Coles," "Packhams," and "Josephines" until May, June or July, replacing them with London Pippins, "Grannies," or other late apples such as Yates or Doherty.

THE PACKING SHED.

On the principle that "one thing leads to another"—and that one progressive move shows the way to the next—the Batlow people were not long in realising that co-operative packing was the natural development of the cool store. In other words, having co-operated with such advantage in one matter, they realised that it was possible to co-operate with equal if not greater advantage in another. The expensive system of marketing their produce individually through city agents was often attended with disconcerting results in particular cases, and always left the feeling that there was surely a better way, could it but be reached.

Individual consignments of fruit are an expensive way of forwarding the produce of the orchard. Few growers can forward 240 cases to Sydney at a time, and for smaller lots the freight is 1s. 3½d. per case, whereas in truck lots it is only 8½d. per case—an appreciable saving of which a "shed" can take advantage.

Then a standard pack on a large scale must surely command attention on the market in a way that a large number of individual packs can not. Under the latter system variations in ideas of quality are inevitable, and the city retailer has a way of safeguarding himself against such variations that is all right for him but not too good for the grower. Even careful growers who wish to preserve their reputation on the market sometimes

find it simply unavoidable to market fruit in a certain grade that should have been dealt with in some other way.

"It does one's name no good," said one orchardist this year when admitting that he had had to lower his standard to get his fruit away, "but you can't afford to lose it altogether."

Compromise of that kind is practically inevitable in individual marketing, while co-operative marketing of a standardised product on a large scale rules it out. Inferior stuff is marketed for what it is worth, but the brands are kept up to the proper mark. Under such circumstances buyers operate with confidence, looking out for the known pack, and even paying a bit more for it. In fact, there are those who consider that a sprinkling of co-operative packing sheds in the fruit districts, all packing to one standard, is of as great importance as a sprinkling of cool stores. Certainly the uniform, standard pack has been one of the outstanding advantages accruing to the extension of the packing house system in the United States.

The Initial Cost and Equipment.

With all this in mind, Batlow growers conceived the idea of a co-operative packing shed, and during the year 1923 formed a company, strictly for the benefit of the shareholders. Of a nominal capital of £5,000, 625 shares were issued at £5 each, of which £1 per share was called up at once. The Rural Bank again received the advances of these enterprising people with sympathy, ultimately lending £2,850. A site was acquired alongside the cool store, in a position in which the one railway siding would serve both sheds —in fact, the two companies, comprising largely the same individuals, act together in various ways. The land and buildings involved an outlay of about £2,000, the packing shed company's contribution to the railway siding was £200, a roadway to the shed cost £131, and the internal equipment ran out to about £1,000.

The shed itself is a commodious one with a floor space of 90 feet by 83 feet, affording accommodation for two mechanical sizers, ample room for all grading, packing, nailing, and despatching operations, and stacking space for about 4,000 to 5,000 cases on account of growers. The structure is of weatherboard with oregon studs, corrugated iron roof, and a hardwood floor carried on concrete pillars. The engine room is underneath the main floor, the two graders being driven from a shaft under the packing floor, while the whole place is fitted with electric light, so that in busy periods work can proceed by night as well as by day.

The Shed Routine.

The rules of the institution require that each grower shall give the management an early estimate of the quantity and variety of fruit he intends to deliver to the shed during the following month, and he is under bond to deliver 95 per cent. of his fruit in any season to the shed, though in special circumstances he may be relieved by the management of the obligation. In this way the manager of the shed knows what fruit to expect and makes his arrangements accordingly.

The grower unloads his fruit from the orchard at the shed doors on to gravity conveyors, which run it round to the part of the shed where it can be stacked until the graders and packers are ready for it. From the stack it is lifted into the bins, from which the graders sort it on to various belts. These graders are chiefly girls working under the supervision of a competent man; all of them received instruction in grading and packing from an officer of the Fruit Branch of the Department of Agriculture, who spent a short time at Batlow for the purpose.

Of the two mechanical sizers, the larger, capable of handling 1,000 cases per 8-hour shift, is the one generally in use, the other being kept as a reserve. The sizer has four travelling belts, on to which the fruit is graded, the belts being used according to the quality of the fruit coming forward. Short tranasverse belts tip the fruit off these belts into bins, alongside which stand the packers. In the height of the season a considerable amount of labour is employed, and occasionally overtime has to be worked to put the fruit through. During the past season, 987 cases were packed during one day of eight hours, and going on for another four hours in the evening the total was carried up to 1,230. The graders and other people in the shed are on wages, but the packers (highly expert men and very fast) are on piece work, and, while averaging 150 cases per day, have reached 180 and 185 cases in eight hours.

From the packers, gravity conveyors carry the fruit to the nailers, who also are equipped with the most modern plant for finishing off the job, one man nailing down up to 800 cases per day. As each case is despatched from the nailer, stamped with the name of the variety and size of the fruit, it is carried by conveyors to the man who pastes on the labels that now begin to be known in many parts of the State. Finally, the cases are stacked by him according to the grades and sizes, close to the platform from which the railway trucks are loaded.

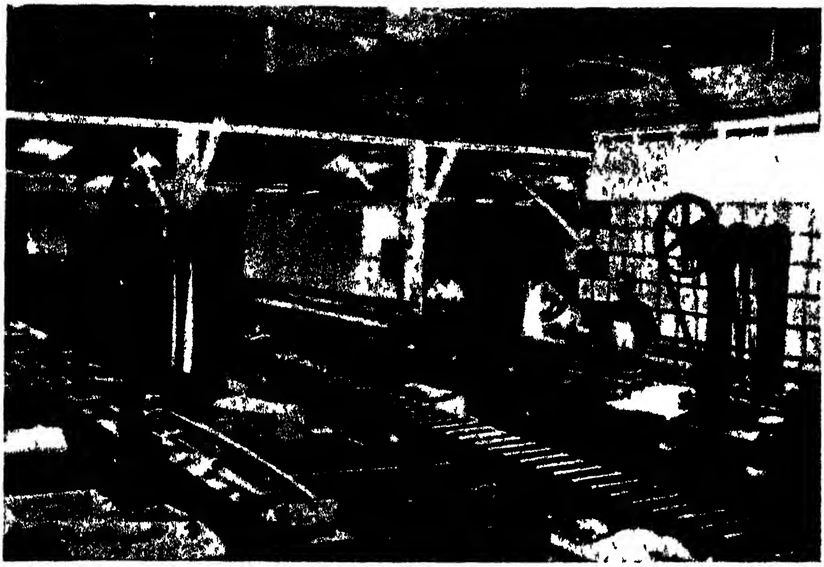
By co-ordination of every movement, the cost of handling has been reduced, until now handling (including first receipt, handling to grader, grading, sizing, packing, nailing down, labelling, stacking and trucking), costs (for labour only) 6¾d. per case. When wrapping paper and other material is included, the actual packing cost in the two months of March and April had been got down to 10½d. per case—a figure that any other district that goes in for co-operative packing must realise can only be reached by maximum efficiency at all stages.

The Grades and Brands.

The grading is done on the principle of keeping up the standard of each quality. Very defective fruit is not included even in the lowest of the shed's three grades, but is marketed by itself without any shed brand. On the other hand, in making "Fancy" grade, it is regarded as a mistake to grade all the high quality stuff as "Extra Fancy," the intention being that as "Fancy" is the grade that is bound to carry the great bulk of the fruit it shall be made really attractive. Three labels have been adopted—"Mountain Maid" for "extra fancy" fruit, "Black Cockatoo" for "fancy," and

a plain label for "choice." All fruit under these labels down to 2-inch is wrapped.

The present season has been a rather light one, unfavourable atmospheric conditions at blossoming time having affected the setting, but at the end of April 35,000 cases had been handled, and it is expected that the season's turnover will reach 50,000 cases. It may be expected that with an average crop, and with an increasing number of growers using the shed, up to 100,000 cases will be packed per season.



The Interior of the Packing Shed at Batlow.
The two grading machines can be clearly seen, the smaller one in the left foreground, and the larger one just in front of the three figures

The question of placing all this fruit to best advantage has been exercising the directors and manager, and early in the present season an effort was made to get into direct touch with the consumer by advertising the case and half-case business, but with rather disappointing results, and the idea is now being explored of taking the fruit right to the Sydneysider by opening depots in the city and suburbs. The bulk of the turnover of the shed cannot be handled that way, of course, but relations with traders in country towns are also being developed, and fruit is now being despatched direct to shopkeepers on the Tweed, in the Riverina, and in many other country towns in the State.

The Pool, and How it Works.

A most important feature of the system is that the fruit is pooled, each grower's consignment losing its identity so soon as it reaches the grader and sizer, and ultimately being paid for on the basis of the average monthly price obtained f.o.r. Batlow for fruit of that description.

On delivery of a parcel of fruit at the shed, the grower receives a shed docket as to the quantity delivered. Later he also gets a certificate showing exactly how his line has graded as to the quality and size, so to that extent he knows its relative value. The fruit is then marketed under one of the shed's three labels, in common with all other fruit of the same variety and grade. At the end of the month the returns for each grade of each variety are pooled and the fruit is paid for accordingly. By watching the figures closely as to size, the manager is also careful that no grower who has delivered a large quantity of a size that realised above the rest suffers disadvantage by its being pooled with less popular sizes.

The charges consist in the first place of the 10½d. for actual packing and material already referred to, plus the case and over-all charges. Two cases are used in the shed—a pine case at 1s. 5½d. for the "extra fancy" and export parcels, and a hardwood or mountain ash case at 1s. 2¾d. made by a local mill, which is used for all other lines. An additional 5d. is also deducted to cover managerial and other overhead charges. According to the class of case used, therefore, the deductions from the pool price amount to 2s. 6¼d. or 2s. 9d., plus, for the present season, 3d. per case for repayment of loan, it being part of the arrangement with the Rural Bank that their advance shall be repaid in five instalments in each year. In addition the directors have hitherto also withheld as "retention money" 5 per cent. of the price realised f.o.r. Batlow, the object being to strengthen the financial position of the shed during its early stages. This retention money is not a charge. It represents a loan from the shareholders, which will be repaid in full. Already a large sum has been accumulated in this way, and other companies will no doubt consider carefully whether or not they should follow the Batlow shed in this respect.

It may be added that the 5d. per case for overhead charges, and the 3d. for repayment of the loan, are variable charges, depending on the number of cases handled, the amount of the loan, &c. Next season both these charges will be considerably reduced in consequence of a larger turnover.

The remark may be made that the pool system has worked so well that further developments of it may take place in the future. A season's pool for a specific variety, for instance, might prove a profitable feature when worked in conjunction with cool storage. If the packing shed was in a position to cool-store a portion of the London Pippin crop when prices were unprofitable, a pool for that variety would be to the advantage of all growers who forwarded London Pippin that season.

Certain other services have also been undertaken by the shed. In some cases outside growers have placed fruit in the hands of the shed for sale—having already packed it at the orchard—and in such cases 5 per cent. is deducted as a marketing commission, whoever the line may be placed with.

The Company does a good deal of buying of orchard necessaries for shareholders on a co-operative basis, selling them at landed cost, plus 5 per cent. In this way growers obtain sugar, spray materials, benzine, kerosene, and

such commodities at a saving. Cases are also procured for growers, the parts being obtained from the timber mills and put together by the shed.

The Packing Shed and Cold Storage.

Reference has been made above to the desirability of the packing shed being able to control the quantity of fruit going forward at any particular time with the aid of cold storage. Quite apart from the advantage delayed marketings may have for individuals, there is an important respect in which they are of interest to a community of growers as a whole. Immediately after Easter in the present season, for instance, 5,000 cases of fruit were put on rail on two train days by the packing shed, and sold through Sydney agents. The period was a most unfortunate one for the growers concerned, for the average price obtained was exceedingly low, the market being very congested. Had it been possible to cool store a large quantity of that fruit it could have been held for six or eight weeks when the 7s. to 8s. would have become 14s. per case.

It cannot be wondered, therefore, that in the contemplated increase of cold storage at Batlow the packing shed is likely to take up space for 3,000 cases. Though small, such accommodation will be of material advantage to all growers who patronise the shed.

In closing this somewhat lengthy account of Batlow enterprise, we cannot but commend its practical importance to orchardists elsewhere. A good deal of pioneering work has been done by these growers that will be to the permanent advantage of other districts who may presently follow their example. Both ventures—cool store and packing shed—have been distinct successes—the cool store especially so, but the shed may also be regarded as having threaded its way between the initial pitfalls, and as now having a fair road before it.

Sulphur as an Orchard Fertiliser.

Has sulphur been used as a fertiliser for citrus trees? Do you advise its use?

The claim has been made, it was stated in reply to this inquiry, that sulphur when applied to the soil acts not only as a disinfectant, but also as a fertiliser or indirect fertiliser—facilitating ammonification and opening the way to active nitrification. In America, on lucerne in the Pacific coast regions, sulphur has given notable results, 275 to 400 lb. per acre being applied. Similar experiments on the Murrumbidgee Irrigation Area in this State have given inconclusive results.

At the present time, sulphur costs £24 per ton. If applied at the rate of 3 cwt. per acre, the cost would be 72s. The cost of 2 cwt superphosphate would be 13s., and 3 cwt. would cost 19s.; similar weights of bonedust would cost 15s. and 25s. 6d. respectively. The two last-named fertilisers give satisfactory results in orchard manuring practice, and the cost of applying sulphur would probably be out of all proportion to any increase in the fruit produced.—A. A. Ramsay, Chemist.

When Pruning the Pear.

Certain varieties of pear—namely, Winter Nelis, Josephine, and Beurre Bosc—require special treatment during pruning, in order to bring them into bearing as soon as others.

A Winter Nelis pear tree at the age of three or four years is generally a very strong grower, and at this age the variety must receive special attention. A considerable number of the laterals—especially those on the outside of the tree—should be left their full length; many more of these laterals are left than on any other variety. The objects of leaving them are:—(1) To steady the growth of the tree by keeping as much of the sap as low as possible. The system prevents the tree from running into wood growth. (2) To furnish blossom buds the following year. Should they not do so they must still be left, and the next year there will be blossom buds in abundance.

The centre of the tree must always be kept well open, and the leaders can always be left a fair length. The leaders of this variety must not be cut hard back. When the tree begins to bear good crops (at say seven years) is the time to commence the very hard thinning of the spurs and reducing the length of the laterals. From then on the tree will require very drastic thinning of its spurs for the best results.

Josephine is very often a straggling-growing tree, but when it has the required number of leaders, very little is necessary beyond a thinning out where the leaders or laterals are too close. The best results are obtainable from this variety by leaving the leaders and laterals untopped. With this style of pruning, a seven-year-old tree will generally yield one or two bushel cases per tree.

Beurre Bosc requires to be cut fairly hard back for the first three or four years in order to give it the required number of leaders. In the meantime, the laterals require special attention. Very often they are cut off as close as possible to the leader, with the result that two strong laterals shoot out, making more work for the next year's pruning. The best results are obtained by cutting the strong laterals off about one inch from the leaders or into the blind buds. By this system a cluster of small buds and laterals will be obtained. Should they burst instead into strong laterals again, one must keep cutting to about one inch until the cluster of small buds or laterals does appear. Weak laterals should be left their full length, and medium ones cut back to two or three inches. When the tree has sufficient leaders and is still growing strongly, they should be left untopped. When the tree (of this or any other variety of pear) comes into full bearing, it should be pruned hard, the laterals shortened, and the spurs well thinned out in order to obtain the best fruit and continuous crops.—G. A. Meier, Orchardist, Bathurst Experiment Farm.

The benefit of cultivation for the conservation of soil moisture is emphasised by experiments carried out at the Dominion Experimental Station, Swift Current, Canada. It was found that stubble land, in the spring of 1924, contained only 1·18 inches of available water, while land summer-fallowed in 1923 contained 6·75 inches. Both soils were seeded to wheat and received 7·73 inches of rain during the growing season. In all, therefore, the crops received 8·91 and 14·48 inches respectively, yet the fallow land, with a 60 per cent. increase in moisture produced 3¼ times as great a crop as that from the stubble land.

Manurial Experiments with Citrus Trees.

W. LE GAY BRERETON, Assistant Fruit Expert, and W. B. STOKES, Orchard Inspector.

EXPERIMENTS to determine (1) whether potash is beneficial to citrus trees on a typical citrus soil, and, if so, whether the muriate or the sulphate is to be preferred; and (2) the relative values of (*a*) superphosphate and bonedust as sources of phosphoric acid and (*b*) sulphate of ammonia and nitrate of soda as sources of nitrogen were commenced at Mr. W. Halcombe's orchard, at Narara, in 1922. The following progress report is published for the information of growers, who, however, would be unwise to form any definite conclusions from the experiment at this early date.

The Potash Experiments.

This series consists of 135 trees in nine rows, giving fifteen trees to the row. It is divided into three plots, each plot comprising three rows, or forty-five trees to each plot. Results are taken from the centre row of each plot only, the row on each side receiving the same manure mixture as the centre row and serving as buffer rows to the adjoining plots receiving a different mixture. The soil is of a sandy character, overlying a friable clay subsoil, and is typical of the good hillside orchard soil of the Gosford district. The bed is situated on a gentle slope in one direction only. The rows run up and down the slope, so that all plots have an even proportion of trees on the upper and lower portion of the slope.

The trees (Valencia Late oranges) were about nine years old and well up to average development at the time of starting the experiment (August, 1922). They would be considered an even lot, but those in plots A are on the whole somewhat smaller than those in plots B and C.

In May, 1923, through a surface drain silting, a heavy rain caused a washout, which was more severe in plot B than in plots A and C.

During September, 1924, the upper seven trees of all plots were soiled.

The following applications of manure were made per tree:—

	lb.
Plot A	3 bonedust.
	3 superphosphate.
	2 muriate of potash.
Plot B (Control) ...	3 bonedust.
	3 superphosphate.
Plot C	3 bonedust.
	3 superphosphate.
	2 sulphate of potash.

These mixtures are low in nitrogen, and if the trees later show want of it a higher percentage will be given to all plots. The manures were applied in August, 1922; March, 1923; September, 1923; April, 1924; and August,

1924. The first results were taken in October, 1923, by picking the fruit from the centre row of each plot; the fruits were machine-sized, and the count of each size from each plot taken from the packed cases. As the centre row of Plot A contained actually only fourteen orange trees and one lemon tree, the yields in Plots B and C were also reduced to fourteen, as shown in Table III. The only variation indicated by these results was a weakening of the bed from plot A towards Plot C, Plot A (muriate of potash) giving the heaviest crop; Plot B (no potash) the next heaviest, and Plot C (sulphate of potash) the lightest crop; and no conclusion could be drawn from these results. No difference could be noticed in the texture of the skin or the quality of the fruit from the various plots.

The 1924 results (taken on 20th October) are shown hereunder. Plot A (muriate of potash) gave the highest count of fruit, Plot C (sulphate of potash) came second, and Plot B (no potash) third. The highest count of fruit may not necessarily indicate the biggest crop—there could be a high count of small fruit—but the packed case can be taken as a fairly accurate standard of measure, and here again Plot A is on top. Plot A comes second and Plot B third.

TABLE I.—Showing Counts of the Fruit in the Potash Experiment Plots.

Plot.	3¼ in.	3⅛ in.	3 in.	2⅞ in.	2¾ in.	2⅝ in.	2½ in.	2⅜ in.	2¼ in.	2⅛ in.	2 in.	Under 2 in.
A	...	113	200	138	718	724	883	786	330	234	260	17
B	...	...	...	138	2	214	527	1,220	726	898	46	178
C	...	...	120	276	280	394	1,025	1,496	249	422	11	70

TABLE II.—Showing Percentages of Fruit of different ranges.

Plot.	Percentage of fruits 3¼ to 2¾ in.	Percentage of fruits 2⅝ to 2⅜ in.	Percentage of fruits 2¼ to 2 in	Percentage of fruits under 2 in.
A	26·5	54·3	18·8	·4
B	3·5	49·7	42·3	4·5
C	15·6	67·1	15·7	1·6

TABLE III.—Showing Total Counts and Cases per Plot and Tree.

Plot.	Total count from Fourteen Trees.	Total crop 2 in. and over computed in Canadian Cases.	Canadian cases per tree.
A	4,409	25·2	1·8
B*	3,686	17·36	1 24
C*	4·053	19·22	1·37

* As explained in the text, there were actually fifteen trees in Plots B and C. Proportionate reduction was made (from 3,949 and 18·6, and from 4,343 and 20·6 respectively) to make the figures comparable with those from the fourteen trees on Plot A.

In Table I are shown the actual counts of size from 3½ inches to 2 inches in an eighth-inch range, and for purpose of comparison these sizes are divided into three groups. From Table II it will be seen that of the largest group Plot A has the highest percentage, Plot C the next highest and Plot B the third; in the centre group C has the highest percentage, A comes second, and B third; and in the smallest group B has the highest percentage, A comes second, and C third. Of oranges under 2 inches B has highest percentage, C the second highest, and A the third. In other words, both potash plots consistently show more large fruit than the no-potash plot. It must be repeated, however, that these are only one season's results, and final conclusions cannot be drawn from them.

It was thought that perhaps the increase in size was through puffiness or an increase in thickness of skin, but oranges from the various plots were cut and compared, and no difference could be noted.

The Phosphoric Acid and Nitrogen Experiments.

Plots 1, 2, 3, and 4 were designed to test the effect of phosphoric acid and nitrogen supplied from different sources, and it was therefore necessary to adhere to a fixed percentage of nitrogen, phosphoric acid, and potash per tree. Plots 1 and 2 tested phosphoric acid supplied by superphosphate *versus* phosphoric acid supplied by bonedust. As bonedust contains an organic nitrogen, nitrogen was supplied to Plot 1 by adding dried blood. Plots 3 and 4 tested nitrogen supplied by sulphate of ammonia versus nitrogen supplied by nitrate of soda; and as the same percentages of nitrogen, phosphoric acid, and potash are preserved in Plots 1, 2, 3, and 4, Plot 1, where the whole of the nitrogen is supplied with dried blood, can be compared with Plots 3 and 4.

This bed of Valencias (about six years old) is not so suitable for a manurial experiment as that in which the potash experiments are located, as the ground slopes in two ways. The trees in Plot 2 are on the average rather weaker than those in No. 1. The trees in No. 3 are on the average about equal to those in No. 1, and those in No. 4 about equal to those in No. 2. During June and July, 1924, all the trees in these plots were heavily soiled. There are ten trees to the row and each plot is composed of three rows. The results are taken only from the centre row of each plot, the other two rows acting as buffers to the other plots.

The following applications of manure were made per tree:—

		lb.	oz.
Plot 1—	Superphosphate ...	2	2
	Dried blood	2	1
	Sulphate of potash ...	0	11
Plot 2—	Bonedust	1	10
	Dried blood	1	9
	Sulphate of potash ...	0	11
Plot 3—	Superphosphate ...	2	2
	Sulphate of ammonia	1	3
	Sulphate of potash ...	0	11
Plot 4—	Superphosphate ...	2	2
	Nitrate of soda ...	1	9
	Sulphate of potash ...	0	11

The applications were made in April, 1923; August, 1923; March, 1924; and August, 1924. The results were obtained in similar manner to those in the potash experiment, and in 1923 no consistent variation was apparent in any direction. The fruit was picked in October, 1924, and the results are shown in Tables IV to VI. It will be noticed that Plot 1 (superphosphate) gave a higher count than bonedust (Plot 2), also a larger yield in cases. That the trees in Plot 1 were on the average rather stronger must not be forgotten. Both Plots 3 and 4, however, had all their phosphoric acid supplied by superphosphate, and though their nitrogen was supplied as sulphate of ammonia and nitrate of soda respectively, they are to some extent comparable with Plots 1 and 2. The trees in Plot 4, too, were of about the same strength as those in Plot 2, yet the yield of Plot 4 was higher than that of Plot 2, which supports the conclusion suggested by comparison of Plots 1 and 2 as to the superiority of superphosphate over bonedust.

Plots 1, 3, and 4 can be compared from the nitrogen point of view.

Plot 3 (sulphate of ammonia) gave both the highest count of fruit and highest yield in cases, with Plot 1 (dried blood) second, and Plot 4 (nitrate of soda) third.

In fairness to nitrate of soda it should again be pointed out that the trees in Plot 4 are on the average weaker than those in Plot 1, and those in Plot 3 are about equal to those in Plot 1.

The variation referred to in the strength of the trees is one of the difficulties in the successful conduct of manurial trials with fruit trees. Even a comparatively small plot of, say, wheat, oats, or barley will contain a great number of plants, with a correspondingly greater likelihood of the plots containing an equal number of plants of varying inherent cropping or other habits; whereas unless the plots of trees are extremely large—which makes for unwieldiness and increases the risk of soil variation—the number of trees per plot are few, and the probability of such equality between the plots proportionately remote. The owner of the orchard, Mr. Holcombe, is taking individual tree records from the trees in these plots. These records will indicate after a few years the distribution of trees of varying cropping propensities throughout the plots, and it may be possible from these records to devise some fairly precise method of allowance for lack of uniformity in the trees.

The fruit was examined for fineness of skin, &c., by Mr. Senior, of the Gosford District Packing House, Ltd. In the potash experiment Mr. Senior awarded the product of Plot A the first place, Plot C second, and Plot B third. In the phosphoric acid and nitrogen experiments, the fruit from Plot 2 was given first place, from Plot 4 second place, Plot 1 third, and Plot 3 fourth.

TABLE IV.—Showing Counts of Fruit in the Phosphoric Acid and Nitrogen Experiment Plots.

Plot.	3¼ in.	3⅛ in.	3 in.	2⅞ in.	2¾ in.	2⅝ in.	2½ in.	2⅜ in.	2¼ in.	2⅛ in.	2 in.	Under 2 in.
1	96	...	378	552	25	358	12	148	...	...	3	6
2	...	78	25	276	16	263	33	196	51	...	26	4
3	...	139	125	414	280	181	201	330	127	52	52	2
4	...	9	55	...	182	331	77	278	215	183	32	89

TABLE V.—Showing Percentages of Fruit of different ranges.

Plot.	Percentage of fruits 3¼ to 2¾ in.	Percentage of fruits 2⅝ to 2⅜ in.	Percentage of fruits 2¼ to 2 in.	Percentage of fruits under 2 in.
1	66·6	32·8	·2	·4
2	40·8	50·8	8·0	·4
3	50·3	37·4	12·2	·1
4	17·0	47·3	29·6	6·1

TABLE VI.—Showing Total Counts and Cases per Plot and Tree.

Plot.	Total count from Ten Trees.	Total Crop 2 in. and over computed in Canadian cases.	Canadian cases per tree
1	1,578	11·2	1·12
2	968	6·1	·61
3	1,903	12·1	1·21
4	1,451	7·4	·74

The Canadian case (measuring 20 x 10 x 11¼ inches) is that used for a large proportion of the oranges grown in this State. It is often called the "gin case" when the lid is leather-hinged.

"AGRICULTURAL MECHANICS."

THE modern farm carries a wide variety of equipment, the effectiveness of which depends largely upon its handling and care. This requires a certain amount of mechanical ability on the part of the farmer, few farms being large enough to keep a fully qualified man employed, and instruction in farm mechanics is therefore part of the curriculum of all training institutions to-day. But not all farmers are college-trained, and the latest addition to Lippincott's Farm Manuals series, "Agricultural Mechanics," therefore arouses curiosity. The book which contains 350 pages divided into twenty chapters, after suggesting the arrangements and equipment suitable for a farm workshop, gives some hints on geometrical construction, and then takes up such useful subjects as farm carpentry, the making of devices for the workshop, the barn, dairy, poultry house, the forge and so forth. Surveying, painting and glazing, water supply, harness repairs, ropes, concrete construction and related subjects all come in for separate chapters. Though intended chiefly for students, the book is of wide interest, presenting an immense amount of material.

Our copy from the publishers, J. B. Lippincott, London.

Pure Seed.

Growers Recommended by the Department.

The Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops, in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon, and (2) after a sample of the seed has been received by the Under Secretary and Director, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the prices for the seeds mentioned hereunder.

Oats :—	
Banner	A. Wallace, Jindabyne, via Cooma.
Tasmanian White	A. Wallace, Jindabyne, via Cooma.
Maize :—	
Fitzroy	R. W. Hindmarsh, "Wiaraga," Bellingen. Manager, Experiment Farm, Grafton.
Ulmarra Whitecap	R. W. Hindmarsh, "Wiaraga," Bellingen.
Leaming	Manager, Experiment Farm, Grafton.
Wellingrove	Manager, Experiment Farm, Glen Innes.
Sweet Sorghums :—	
Collier	Manager, Experiment Farm, Grafton.
Early Amber Cane	Manager, Experiment Farm, Bathurst.
Gooseneck	Manager, Experiment Farm, Lismore.
Honey	Under-Secretary, Dept. of Agriculture, Sydney.
Saccaline	Manager, Experiment Farm, Lismore.
Selection, No. 34	Manager, Experiment Farm, Yanco.
Selection, No. 61	Manager, Experiment Farm, Grafton.
Grain Sorghums :—	
Milo	Manager, Experiment Farm, Cowra.
Feterita	Manager, Experiment Farm, Coonamble.
Manchu Kaoliang	Manager, Experimental Farm, Bathurst.
Dual-purpose Sorghum :—	
Darso	Manager, Experiment Farm, Glen Innes.
Potatoes : —	
Batlow Redsnooth	E. M. Herring, "Sheen," Batlow.
Carman No. 1	Moreton McDonald, Crookwell.
Coronation	E. M. Herring, "Sheen," Batlow.
Early Manhattan	K. Bowen, Springside, via Orange.
Factor	K. Bowen, Springside, via Orange.
Langworthy	K. Bowen, Springside, via Orange.
Surprise	K. Bowen, Springside, via Orange. Moreton McDonald, Crookwell.
Symington	K. Bowen, Springside, via Orange.
Grasses :—	
Phalaris bulbosa	Col. H. F. White, "Baldblair," Guyra. Manager, Experiment Farm, Glen Innes.
Hooker's Fescue	Manager, Experiment Farm, Glen Innes.
Tall Oat	Manager, Experiment Farm, Glen Innes.
Sudan Grass—	
Sudan Grass	Manager, Experiment Farm, Cowra. Manager, Experiment Farm, Temora. Manager, Experiment Farm, Nyngan. H. K. Nock, Nelungaloo. R. Wilson, North Logan, Billimari.

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

Foul Brood in Bees.

Sterilisation of Infected Combs.

H. GRAHAM SMITH, Apiarist, Hawkesbury Agricultural College.

There is still very much doubt in the minds of professional apiarists as to whether combs infected with American foul brood (*Bacillus larvae*) can be effectively sterilised and made fit for use without a recurrence of the disease in the hive, and at a figure that will make the treatment of such combs a payable proposition. The discovery in 1922 of a method of treatment by Dr. Hutzelman, who used a 20 per cent. formalin-alcohol solution (the mixture now commercially know as Hutzelman's solution) was received by bee-keepers with much interest, but little hope was entertained that this method would ever be practicable, on account of the high cost of the solution and excessive evaporation that took place during the process of treatment. It will be a matter of interest to bee-keepers to learn that a formalin solution with water as a diluent has given results equally as effective as the Hutzelman patented solution. The following extract, which is taken from a report* by D. H. Jones, Professor of Bacteriology, Ontario Agricultural College, Canada, speaks for itself:—"The questions we wished to decide in the following experiments were, first, whether or not Hutzelman's claims could be substantiated, and secondly, whether or not the use of water as a diluent could be substituted for alcohol with satisfactory results. Accordingly, combs were immersed for twenty-four and forty-eight hours respectively in various aqueous dilutions of formalin, alcohol dilutions of formalin, and Hutzelman's solution, after which cultures were made from the larval scales as above described.

Disinfectant.	Combs immersed 24 hours.						Combs immersed 48 hours					
	Cultures from Capped Cells.			Cultures from Uncapped Cells.			Cultures from Capped Cells.			Cultures from Uncapped Cells.		
	1	2	3	1	2	3	1	2	3	1	2	3
Formalin 100 ...	O	O	O	O	O	O	O	O	O	O	O	O
,, 50, Water 50 ..	O	O	O	O	O	O	O	O	O	O	O	O
,, 25, ,, 75 ...	O	O	O	O	O	O	O	O	O	O	O	O
,, 20, ,, 80 ..	O	O	X	O	O	O	O	O	O	O	O	O
,, 15, ,, 85 ...	O	O	X	O	O	O	O	O	O	O	O	O
,, 10, ,, 90 ...	O	X	X	O	O	O	O	O	O	O	O	O
,, 50, Alcohol 50 ...	O	O	O	O	O	O	O	O	O	O	O	O
,, 20, ,, 80 ...	O	O	O	O	O	O	O	O	O	O	O	O
Hutzelman's Solution ...	O	O	X	O	O	O	O	O	O	O	O	O

X Indicates growth of *B. larvae*. O Indicates no growth of *B. larvae*.

* "American Foul Brood of Bees"; *Scientific Agriculture*, Feb., 1925, pp. 190–195.

"It will be seen from the table that in the case of uncapped cells, after twenty-four hours' immersion in all dilutions of formalin used, the spores of *B. larvae* were killed. In the case of the capped cells, however, a few of the spores were not killed in this length of time, either in the water dilutions or in the Hutzelman solution.

"After forty-eight hours' immersion, however, all spores were killed in capped cells as well as uncapped cells. Thus, in these experiments, the water dilutions of formalin proved to be as effective as the alcohol solutions in destroying the sporès of *B. larvae* as they occur in the scales of infected brood combs.

Washing the Formalin from the Treated Combs.

"On removing the combs from the formalin dilutions, strong odour of formalin persisted on the combs for days. As this odour is strongly objectionable to bees, attempts were made to get rid of it. The method that gave the best results was washing the combs under the water tap immediately on removal from the formalin. The combs should be held in a slanting position and passed backwards and forwards and from side to side under the free flowing tap. In this way all traces of the formalin can readily and easily be removed, after which the combs are stood up to dry."

Similar tests were also made with certain proprietary disinfectants in varying proportions, but in each case growth of *B. larvae* was obtained from combs immersed in solutions for periods varying from forty-eight hours to eighteen days.

From the foregoing report, bee-keepers may reasonably hope that by widespread and consistent effort in districts badly infected with American foul brood, the enormous losses of those who are at present compelled to boil down their combs may be overcome

Fertility and Soil Moisture.

At present there is a reaction from the older chemical view of soil fertility, and the present tendency is to emphasise the importance of physical properties in determining the potentialities of any given soil. The modern study of soils lies as much in the province of the physicist as of the chemist. Perhaps the most important properties of the soil are those connected with the supply of water to plants, and much attention is being given to the study of the moisture relationships of soils. In a region of generally uniform climate, differences in moisture conditions are largely responsible for the adaptation of crops to particular soils and the occurrence in one district of permanent grass, and in another of uncultivated waste. The mode of supply of water to crops is also a principal factor in the adaptation of soil for forest growth. It must also be remembered that a study of the water economy of soils is of the first importance for irrigated cultivation, to which we must look increasingly in the future to contribute to the world's food supply. It is not surprising, therefore, that some of the most important and promising work in soils at the present day deals with soil moisture, and one may expect considerable advances when the principles underlying its control are elucidated and applied to soil management.—G. W. Robinson, in the *Welsh Journal of Agriculture.*

Poultry Notes.

July.

JAMES HADLINGTON, Poultry Expert.

Success in poultry-farming is almost solely dependent upon one's ability to rear chickens, and the next few months, therefore, is the period during which ability to succeed will be tested. No amount of knowledge on other matters in connection with poultry-farming will compensate for deficiencies in skill and aptitude in connection with rearing chickens. Taking the poultry industry as a whole, the losses sustained during the six weeks covering the brooding stage of rearing chickens are enormous. This is not alone due to defective or questionable methods of brooding, although these are much in evidence, but it is more largely due to lack of knowledge and to faddism—trying to do something different from proved principles.

Nor are such failures confined to any particular class of brooder. One sees both success and failure with all sorts of brooders. Hot water circulating systems with both boxes and hovers, colony, lamp, and fireless brooders, and even brooding with hens, all contribute to the general loss of chicken life.

Boiled down, it is less the fault of the system than the operator. The latter may be a thoroughly hard-working and painstaking person, but somehow he manages to take the wrong track, often the result of unsound neighbourly advice. In short, the attitude of mind that is always in opposition to proven methods is responsible for the perpetuation of irregular methods and consequent failures.

Standardisation of Practice.

It is too much, perhaps, to expect everyone to think and act alike, but there are certain well-defined lines of procedure applicable to all trades and professions from which one cannot depart without risk of failure, and the rearing of chickens is no exception to this rule. Yet the "beliefs" and "opinions" that exist in respect of brooding chickens would be highly amusing were the results less tragic in their economic incidence. The question is not "which brooder system" so much as the fact that all chicken life is the same, and will not accommodate itself to the opinions of the person who desires to rear them. We should endeavour to fit our methods to the needs of the chicken, and not the chicken to our whims or convenience.

The main essentials in brooding are—(*a*) warmth sufficient to keep the chickens comfortable, (*b*) pure air, (*c*) good food and water, (*d*) good sanitation, (*e*) ample room for exercise.

With regard to (a), this does not mean that chickens should be reared like a hothouse plant in an even temperature all the time. That would be the worst form of brooding. What it does mean is that the temperature provided should be such as will enable the chickens to take advantage of it even in the day time as soon as they feel the cold, and at night it should keep them sufficiently warm, so that they will not be forced to congregate and close up in order to be comfortable. It is no use to say the brooder, or the house, is large enough for many times the number of chickens being run. Space will not prevent packing, nor will all the ingenuity of the attendant in rounding off the corners or any such attempted palliatives prevent "crowding"; only sufficient warmth will do that, and no matter whether it is applied (as in heated brooders) or conserved (as in the fireless arrangement), the principle is the same.

In the latter system strips of flannel, or some such woollen material, is the means whereby the bodily temperature is preserved, and whereby the chickens are divided to some extent from too close contact with one another. Trouble arises here when the flannel strips are lifted above the chickens and they can no longer nestle among them. This is one of the main troubles in cold brooding. With heated brooders, trouble commences just as soon as the temperature falls below what is required to induce the chickens to spread out.

It is not so much the cold that hurts the chickens as the crowding together, and the sweating that consequently takes place. It is not too much to say that 95 per cent. of chicken trouble arises from this cause. Strange as it might appear, nearly all the cases of illness arising from this simple cause are put down to coccidiosis, white diarrhœa, or other chicken diseases. If poultry-farmers would look closely into their brooding there would be very little heard of the diseases mentioned.

No harm can come from high temperatures if the brooder is so constructed as to allow the chickens to get away from the heat to a more temperate zone. Trouble from over-heating can only arise where the chickens are shut in and confined to it. Chickens, like any other animals can be relied upon to seek comfort, and that will resolve itself into a temperature that is best suited to their bodily requirement.

Feeding Experiment.

At the conference of poultry-farmers held at Hawkesbury Agricultural College in July last year it was announced that the next set of feeding experiments to be carried out there would be on ratios, and that these would be commenced in the spring of that year. In accordance with this announcement 160 pullets were penned, divided into four lots of forty each, which were again subdivided into twenty each, two twenties being regarded as one unit for the purpose of the experiment. Since the ratio fed would depend upon the quantity of meat meal or concentrates used in connection with the other constituent articles of the morning mash, it was decided that it would simplify the experiment if it was arranged in terms of the quantities of meat meal used daily for the different lots.

The following was the morning mash fed to each section, in conjunction with a grain ration of two-thirds wheat and one-third maize for the evening meal:—

Pens 1 and 2.—Pollard, 66⅔ per cent.; bran, 33⅓ per cent.; meat meal, nil.
Pens 3 and 4.—Pollard, 65 per cent.; bran, 32½ per cent.; meat meal, 2½ per cent.
Pens 5 and 6.—Pollard, 63⅓ per cent.; bran, 31⅔ per cent.; meat meal, 5 per cent.
Pens 7 and 8.—Pollard, 61⅞ per cent.; bran, 30⅝ per cent.; meat meal, 7½ per cent.

The experiment was conducted over the flush period of laying—September to March inclusive—so that it has a direct bearing and value in connection with the question that was being debated at the time as to the necessity of feeding meat meal or concentrates during the summer months. The results of the experiment are presented in the following table:—

	Meat Meal.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Total.	Average Eggs per Hen.
	per cent.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.	eggs.
Lot 1.—40 Pullets ...	Nil.	786	718	693	624	567	269	86	3,643	91
„ 2.—40 „ ..	2½	761	764	637	615	492	271	146	3,686	92
„ 3.—40 „ ..	5	784	816	704	716	600	399	246	4,265	106·6
„ 4.—40 „ ..	7½	744	795	661	674	584	401	286	4,145	103·6

Comments on the Experiment.

The table shows that as between the group fed on 2½ per cent. meat meal and none at all there is a difference of 43 eggs in favour of the former, but as between the group fed without meat meal and that receiving 5 per cent. there is a difference of 622 eggs, or nearly 52 dozen eggs in favour of feeding meat meal on that basis. The lots fed 7½ per cent. meat meal actually gave 120 eggs less than the 5 per cent. group.

A close observation was kept as to the condition of the birds during the experiment, but it was not until February that there was any noticeable disparity between the various groups. In that month the no-meal and the 2½ per cent. meat meal groups were seen to be falling off in condition, compared with the two groups receiving 5 and 7½ per cent. meat meal respectively. During the whole of March there was a marked difference in the health and condition of the two latter groups as compared with the two former, in so much that they were standing the strain of the moult much better. In the no-meal section, in particular, there were distinct signs of fag.

The Financial Aspect.

On the question whether it pays to feed meat meal the result is important. A calculation shows that the forty birds in the 5 per cent. meat meal section consumed meat meal to the value of 9s., but they produced two short of 52 dozen more eggs than the no-meat group, the value of which was £3 16s. 3d. The profit on meat feeding on the 5 per cent. basis was thus £3 7s. 3d. This, in conjunction with the better condition of the birds

at the conclusion of the test, shows the value of meat feeding over no-meat feeding to be of considerable importance. M.I.B. meat meal was used in the test.

This seven months' experiment having been carried out over the warm part of the year, and the result being so remarkable, it was decided to carry out another test over the full twelve months. From this experiment, which commenced on 1st May, it is expected valuable data will be obtained on all points, such as egg production and behaviour of the birds in respect of moulting, &c.

Certificate for Export of Live Stock.

For the information of poultry-farmers it might be stated that since the arrangement come to with other States at the conference of Ministers of Agriculture in May, 1924, it is not now necessary in all cases to have birds for export to other States inspected. The procedure to be followed is to write to the Chief Veterinary Officer, Stock Branch, Department of Agriculture, Sydney, for a declaration form, stating the State to which it is desired to export birds. This officer will then cause the necessary form to be sent to the applicant. The form must be filled in and declared before a justice of the peace. It must then be returned to the Stock Branch for signature, when, if the Chief Veterinary Officer is satisfied after consultation with the Poultry Expert that the farm from which the birds are to be sent is free from disease or tick, he will endorse the certificate and return it to the farmer, who must send it with the birds to their destination. In the event of there being any doubt as to the freedom from disease or tick on any particular farm, it will be necessary for an inspection to be arranged before the birds can be forwarded.

The Agricultural Bureau Conference.

Some two hundred and seventy delegates have been nominated to attend the State Conference of the Agricultural Bureau at Hawkesbury Agricultural College on 20th to 22nd of this month. Among the organisations to be represented are the Australian Meat Council, New South Wales Graziers' Association, Fruitgrowers' Association, Bee-keepers' Association, Batlow Packing House, Queensland Council of Agriculture, South Australian Advisory Board of Agriculture, Victorian Chamber of Agriculture, New South Wales Chamber of Agriculture, Clydesdale Horse Society, Rural Bank, Registry of Co-operative Societies, and the Sydney and Victorian press. Among the addresses will be the following:—"Some Aspects of the Milk Question," Mr. Lindsay Evans (Dapto); "Farmers' Experiment Plots," Mr. J. P. Mooney (Taree); "A System of Keeping Dairying Accounts," Captain Colyer (Gocup); "Co-operative Marketing of Apples and Pears," Mr. H. V. Smith (Batlow); "Maize Storage," Mr. H. Wenholz, B.Sc. (Agr.); "Veterinary Research," Dr. H. R. Seddon, D.V.Sc.; "Breeding Farm Horses," Mr E. B. Comans; "The Meat Industry," Mr. A. G. Manning, M.P.; "Women and the Bureau," Miss Lorne Byrne B.Sc. (Agr.); "Agricultural Organisation," Messrs. H. H. Bentley (Queensland Council of Agriculture), and H. J. Finnis (Secretary South Australian Advisory Board of Agriculture).

Orchard Notes.

July.

W. J. ALLEN and W. LE GAY BRERETON.

In deciduous orchards, especially on the tablelands, where apples and pears are largely grown, pruning will be one of the chief operations at this period A leaflet on this subject may be obtained free of charge on application to the Under Secretary and Director, Department of Agriculture, Sydney. There is also a more extensive publication on the subject, which may be secured from the Government Printer, Sydney; price, 3s. 3d., post free.

Some Pruning Matters.

It may be mentioned here, however, that in forming young trees, especially upright-growing apple and pear trees, it is necessary to head back the leaders heavily. This is done to obtain a plentiful supply of strong shoots from which the more spreading ones can be chosen for the extension and multiplication of the frame work. It also checks too rapid extension, and thus avoids development of a framework of limbs too slender for their length. This heavy cutting often seems wasteful of growth, but tests carried out many years ago by the Department with the object of devising a method by which it could be avoided resulted, with very few exceptions, in a framework of undesirable form and frequently serious breakages when the trees came into crop.

However, after the framework is established and the lower parts have stoutened up, and if the tree is still making heavy leader growth, it is often advantageous not to head the leaders back. This subject was dealt with in a previous number of the *Agricultural Gazette*, and information on it is also available in leaflet form. Where some of the superfluous inside leaders can be left without danger of sapping those required for building the framework, it is a wise plan to do so, as their presence causes the new shoots to grow in a more outward direction, and in exposed situations they assist the new growth from becoming inclined by the prevailing winds. Such superfluous growths, of course, must be removed at some subsequent pruning when the framework has stiffened in the desired position.

In some instances growers last season left the laterals of Rome Beauty apples uncut, and from the results are inclined to adopt this as a method of dealing with this variety. We would warn them against being too hasty in this decision. We have examined some laterals so treated last season and have found they were on trees that had been treated for some years under the system of the stubbing of the lateral, and on the older parts of the tree they were making only comparatively short yearling laterals, which, when uncut, bore on the end and did not leave long lengths of bare wood. Had this been done when the trees were younger and more vigorous the laterals would have been longer, and excessively long lengths of bare wood resulted.

This does not apply, of course, to that class of lateral with plump buds which occurs to some extent in Rome Beauty, and which spurs readily when given length. In some localities—the warm, granite, wheat districts of the south, for instance—this class of lateral predominates in the Rome Beauty. It is a fact that in strong-growing young trees the stubbing results in long shoots until the tree has slackened in growth, but the desired result can be obtained in such trees far earlier by repeating the operation towards the end of January.

We fully appreciate the difficulty of carrying out such summer work, but it is only necessary for a season or two while the trees are young, and this particular operation can practically be followed by rule of thumb, so it can be pushed through by unskilled assistance with very little supervision.

Orchard Burners.

Deciduous fruit growers are again reminded that orchard burners are the cheapest method of clearing up prunings. A burner can be made from an old square tank, and suitable iron wheels can generally be picked up from the scrap heap of a country blacksmith's shop or foundry. A simple design for building such a burner was published on page 301 of the *Agricultural Gazette*, April, 1919. Burning off prunings is a good job first thing on frosty mornings.

Ploughing.

Where autumn ploughing has been carried out and the ground has not become compacted again from any cause, it can be left till towards the end of spring. Where no autumn ploughing has been done, or where cover crops have been sown, ploughing should be well advanced this month. This applies to both citrus and deciduous orchards. It gives any growth, whether cover crop or weeds, time to rot before the spring, and provides a supply of plant-food for the trees when they require it. But not only this; it allows the soil to absorb the rains that fall during the latter part of the winter, and checks evaporation of moisture already absorbed by the soil.

Even in the wetter climates of the tableland, a dry period is often experienced during the spring, when the soil dries out with surprising rapidity, especially if the land is carrying a heavy growth of weeds or cover crop. The trees then suffer from partial starvation at a critical period, and if a dry summer follows, which cannot be foretold, the position is still worse. In some of the later districts of high, regular rainfall it may be safe to postpone this work some weeks, but generally speaking it is better to err on the early side than on the late side.

Manuring.

Except for the soluble nitrogenous fertilisers, such as sulphate of ammonia or nitrate of soda, manuring can be carried out during this ploughing. Bonedust and bone and offal take some time to decay and become available to the plants, and though superphosphate is soluble it soon reverts to a less soluble form, and there is little danger of either it or potash fertilisers being lost in the drainage water from the soil. That it

pays to manure citrus trees is universally recognised in this State. On rich, deep soil it may not be necessary for the first few years after planting, but later when the trees have borne a few heavy crops fertilisers are necessary to obtain maximum returns.

With deciduous fruits generally, and with apples and pears especially, there is not nearly the same certainty of manuring paying on all classes of soil. On our very poor, light, sandstone soils the manuring of even young apple trees is necessary to obtain sufficient growth to build up a tree of reasonable size, and later to maintain sufficient vigour in the tree when it is cropping Undoubtedly in these cases stable manure gives the most satisfactory results. An instance is also known where old apple trees on rich, deep soil were restored to vigour and profitable cropping by heavy applications of stable manure. It seems feasible that in such cases the results obtained are to some extent indirect, in that the stable manure has improved the condition for soil bacteria, and has also improved the capacity of the soil for retaining moisture. At the departmental orchards at Bathurst and Glen Innes, the first on a granite country and the latter on a heavy basalt soil, experiments in manuring of apples have completely failed to show any result; at the latter place the experiment is being continued.

It is interesting to note that similar results have been observed in the United States of America, and it will not be out of place to quote here from Bulletin No. 516, published by the New York Agricultural Experiment Station under the title "Twenty-five Years of Fertilisers in a New York Apple Orchard," by U. P. Hedrick and H. B. Tukey. The summary says:—

These are the results of twenty-five years of fertilisers in a New York apple orchard under a system of clean cultivation and non-leguminous cover cropping.

The orchard, twenty-eight years old, is located on a Dunkirk clay loam, slightly heavier than the best New York apple land. The variety is Rome Beauty budded on Ben Davis. The trees were selected with strict attention to uniformity.

The experiment consists of twelve plats of five trees each. Four plats receive no treatment and the remaining eight receive four different treatments in duplicates.

Fertilisers have been applied since the fall of 1899 at the following rates per acre:—

Plats 1 and 9—11,200 pounds of stable manure.
Plats 2 and 8—340 pounds of acid phosphate.
Plats 6 and 10—340 pounds of acid phosphate, 196 pounds of muriate of potash.
Plats 4 and 12—100 pounds of nitrate of soda, 346 pounds of dried blood. 340 pounds of acid phosphate, 196 pounds of muriate of potash.
Plats 3, 5, 7 and 11—Checks, no treatment.

A non-leguminous cover crop has been sown annually and the orchard kept in good tilth.

Records have been kept of growth, size and yield of fruit, and of such miscellaneous factors as colour of foliage and quality, maturity, keeping quality, and colour of fruit.

The application of fertilisers has resulted in no consistent differences either in total yield of fruit, size, colour, date of maturity, flavour, texture, or keeping quality.

There has been a tendency for the trees to produce the same proportion of fruit grading 2¼ inches and above, in spite of differences in yield, growth, or fertiliser applications.

One of the most reliable indexes of tree performance is trunk diameter. In this measurement all plat treatments approach a common average, fluctuating slightly about the check as a common centre. The trees receiving manure average 0·08 of an inch smaller than those receiving no fertiliser, while those receiving a complete fertiliser are 0·06 of an inch larger.

The plats which have the large trees have also been the high producing plats as well as the plats leading in yield of fruit 2¼ inches and above.

Measurements of growth made in 1899, before any fertilisers had been applied, indicated differences in vigour of trees. The ranking of the plats at that time approaches closely the ranking in 1923. The treatments which have given the largest yields of fruit ranging 2¼ inches and above, and the biggest trees, were, by actual measurement, the most vigorous twenty-five years ago, before an ounce of fertiliser had been applied. The various fertiliser treatments, have failed to alter the direction in which the plats were headed before they received these different treatments.

High or low individual tree performance has not been a matter of bud variation. The importance, however, of securing the best and most vigourous trees possible for orchard planting is emphasised.

The trend of this experiment has not been appreciably altered by the thirteen additional harvests since 1910.

The practical outcome of the fertiliser test is that in the average western New York apple orchard that is well cultivated, properly drained, and sufficiently supplied with organic matter and humus by means of a cover crop commercial fertilisers are not needed.

Besides dealing with the results from the twenty-five years' experiments, a summary of reports from other States regarding fertiliser applications in apple orchards is given in this bulletin:—

In the first place fertiliser studies on the Pacific coast, namely in the State of Washington, have indicated that no form of commercial fertilisers are of value, except when used in orchards the growth of which is unsatisfactory or in which cover crops have been established [this probably means a permanent cover crop]. In Kansas the beneficial effect of manure has been ascribed to the preservation of moisture during periods of drought, while in the Ozark regions fertilisers have increased the set of fruit on poor leachy soils and have assisted in carrying the crop through, though on fertile soils the response has not been large. From Indiana it has been reported that nitrate of soda has little effect in orchards under cultivation. West Virginia has been led to the conclusion that the average well-cared for orchard is not apt to respond to fertilisers, while her neighbour, Virginia, has reported that cultural treatments are more effective than fertiliser applications. Pennsylvania has stated that "trees under cultivation have not shown a profitable return from the addition of fertilisers when a good cover crop was grown." New Hampshire has found no cash returns from money invested in fertilisers in a Baldwin apple orchard under cultivation, and results of fertiliser treatments in England have indicated no favourable response to manurial dressings.

On the other hand nitrogen has been responsible for increased yields in Delaware, though increased applications have not been commensurate with resulting yields. The combination of cover crops and nitrate has resulted in increased yields in Oregon, and in Ohio, on land low in fertility, nitrogenous fertilisers have produced a marked effect. Fertilisation in Michigan "has not yet made good trees into super trees, but it has made poor trees good or kept good trees from becoming poor."

The Bulletin concludes the matter as affecting apples thus:—

"In general it can be said from these results reported from various sections of the country, contradictory as some of them may seem, that fertilisers are, in the main, held to be of value on thin or worn-out land, or in orchards which are making weak growth. At the same time, well-cared for orchards on good land, under proper methods of clean cultivation and cover cropping, show little favourable response to fertiliser applications.

"If sod orchards were to be considered in this connection, it would be apparent at once that there is hardly a single exception to the general rule that sod orchards respond markedly to nitrogenous fertilisers."

In the quoted remarks the term manure is used to indicate stable or farmyard manure in distinction from commercial fertilisers.

Spraying for Peach Leaf Curl.

Except for the early-blossoming peaches, such as Bell's November, Edward VII, &c., which must be sprayed earlier, July is a good period to apply the winter fungicide, either lime-sulphur (full winter strength) or Bordeaux mixture 6-4-40, for peach leaf curl. Though repeated departmental tests, both inland and on the tablelands, have resulted in control of this disease by one thorough application of either of these fungicides while the trees were dormant, some growers, particularly in the northern tablelands, have not had satisfactory results with one application, and find it better to give an application of winter strength lime-sulphur when the trees are dormant, followed by Bordeaux mixture 6-4-50 when the blossom buds are first showing colour. Of course, this second application is not advisable except in districts where previous experience has shown it to be necessary. Where one dormant application of lime-sulphur has been found satisfactory it is preferable to use lime-sulphur rather than Bordeaux mixture, as the former also acts as a check to San José scale.

Green Peach Aphis.

This is a very difficult pest to deal with after the trees are in foliage, as the green aphis hide between the young folded leaves, and thus miss the spray. Spraying with oil at the end of winter, the latter part of July or early in August (except for early-blossoming varieties already mentioned) has on previous occasions given wonderful results in controlling this pest on some of the departmental orchards. Last season the miscible oil spray was not as consistently satisfactory as previously, and it would be advisable this season to use miscible spray oil rather stronger, say, 1 to 20 of water by volume instead of 1 to 25.

Where it is necessary to spray for leaf curl with lime-sulphur or Bordeaux mixture, they should be applied first and the miscible spray oil two or three weeks later, timing the first spray so that the oil will be applied before the buds are much swollen.

Cherry Aphis.

This pest has only lately become troublesome in this State, and hence no field tests have been carried out for its control. The Tasmanian Department of Agriculture recommends winter-strength oil sprays or lime-sulphur in the early spring, when the covering scale of buds is loosening slightly. The Victorian Department of Agriculture last year found that miscible oil spray of 1 to 20 of water by volume applied in August before the trees commenced to shoot was effective.

San José Scale.

Some growers get better results with oil and others better results with lime-sulphur in dealing with this pest. That this is so is no more peculiar than other eccentricities that often become apparent, especially during spraying experiments.

On the whole, the oil sprays have proved the more efficient in control of San José in the departmental orchards. When the oil sprays are used they should be applied for safety before the buds are much swollen, using winter strength. If lime-sulphur is depended on, be sure it is full winter strength by testing the stock solution with a hydrometer and diluting according to the table. Better results are generally obtained by delaying application till the buds are well swollen. See that every part of the tree gets a good coating.

Woolly Aphis.

Last year the Victorian Department of Agriculture tested and found the following spray very effective for woolly aphis:—Red oil, 1 gallon; nicotine sulphate 40 per cent., 1 pint; soap, 2 lb.; water, 80 gallons. The following method of mixing was published in the Victorian *Journal of the Department of Agriculture* for December, 1924. The soap was boiled in 1 gallon of water till dissolved, the 1 gallon of red oil added and thoroughly mixed, 1 pint of nicotine sulphate added, and the three mixed for a few minutes, when the whole was made up to 80 gallons with water. Trees sprayed on 1st May were still clean of aphis when examined on 20th November. The use of this spray is recommended when the trees are dormant.

It is well worth while apple-growers giving this mixture a trial on some badly-affected apple trees, using oil at winter strength alone, and 1 pint of nicotine sulphate 40 per cent. to 80 gallons water alone on other badly-affected trees of the same variety, to act as checks. Though it is to be hoped that the Victorian Department's mixture will go on giving equally good control, one cannot make sure on one season's results. Both nicotine sulphate 40 per cent. and tobacco wash combined with lime-sulphur, when tested by the New South Wales Department ten years ago, kept trees clear of woolly aphis for longer than either the same strength nicotine sulphate or tobacco alone, but in a testing the following season the combination gave no more lasting effect than the two washes applied singly. Since that time we know of instances where the combination has given the same result as when first tried. At the same time, in districts where lime-sulphur is used as a fungicide from "spur-burst" to "pinking stage," it is a good practice to combine either tobacco wash or nicotine sulphate 40 per cent. with the lime-sulphur for woolly aphis, care being taken to keep the right proportion of each spray to the total liquid of the combination. We have found that nicotine sulphate 40 per cent. or tobacco wash applied as just stated keeps the trees clear of aphis just as long as those sprayed with miscible spray oil earlier, and one operation is saved.

Caustic soda 1 lb., nicotine sulphate 40 per cent. ¾ pint, water 100 gallons, applied before the trees start in the spring, is another woolly aphis spray that some growers have found very effective and which is worth trying. Leaflets on lime-sulphur, Bordeaux mixture, and peach leaf curl can be obtained free on application, and a bulletin on "Spraying" for 1s. 1d., post free.

Warning.

Growers who have received the woolly aphis parasite *Aphelinus mali* should be careful not to apply any contact insecticide (such as is used for aphis or scale) to the protected trees on which they liberated the parasite.

Beginning in Bee Culture.

In starting bee-keeping a nucleus colony of well-bred bees is sometimes purchased from a queen-rearing apiary, and the intending bee-farmer sets out, at any rate, with such knowledge of bee management as will ensure a good start. Frequently, however, the move is less premeditated, being prompted by the capture of bees from a bee tree or of a stray swarm, and in this case their owner has to do the best he can in a business of which he knows practically nothing. It is for the guidance of such persons that the Department has published *Farmers' Bulletin*, No. 129, "The Beginner in Bee Culture," which is obtainable (from either the Government Printer or the Department) for 10d., post free.

The chief cause of failure is a wrong start. To be compelled to work some of these apiaries which have been built up on a wrong beginning would be sufficient to dishearten the most expert and enthusiastic apiarist. To lever the supers apart and get the frame out of the "any old hive" sometimes used requires scarcely less than a crowbar, and during such manipulation it is not surprising that the bees become decidedly angry.

The following common questions and their answers will doubtless be of interest to beginners :—

(*Q.*) : How often should I examine my hive?

(*A.*) : Once every seven or eight days during the active working season should be sufficient. Take notice during examination of the progress made in the hive, and provide accommodation for the next period. It should not be necessary to examine the colony during the winter months, or during cool weather.

(*Q.*): How can I tell when my colony is in order?

(*A.*): A colony may be considered in order if there is a fair quantity of stores available, the queen is laying well in season, and there are good combs in the brood chamber—good worker combs such as are built from full sheets of comb-foundation. There should also be sufficient accommodation to allow for expansion of the brood and for honey storage.

(*Q.*): How often should I rob my bees?

(*A.*): Much depends upon the flowering flora and the condition of the colony. There is no set period. Observation of the progress made by the colony in honey storage will clearly show when sufficient surplus is available for extraction. "Extracting," not "robbing," is the term used by the more up-to-date men nowadays. One can, of course, rob the bees by taking all their winter stores at the close of the season.—W. A. Goodacre, Senior Apicultural Instructor.

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alterations of dates should be notified at once.

1925.

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Tumut A. and P. Association	T. E. Wilkinson	Mar. 2, 3
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Campbelltown A. Society	W. N. Rudd	,, 12, 13
Royal Agricultural Society	G. C. Somerville	,, 29 to April 7

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Agricultural Gazette of New South Wales.

The Storage of Maize.

SILOS ON THE ATHERTON TABLELAND, QUEENSLAND.

H. WENHOLZ, B.Sc. (Agr.), Special Agricultural Instructor.*

THE Atherton Tableland is situated about 40 miles south-west from Cairns, has an elevation of about 2,000 feet, is composed of very deep, red volcanic soil, and has a rainfall of about 60 inches, about 45 to 50 inches of which falls during the period October to April. The winter or cool season period from May to September is marked by dry and mild weather, with some fairly warm days and mostly rather cool nights, with at times light frosts. The influence of the season is reflected in the fact that bananas and sugar-cane (cow cane) grow well, only in occasional winters being cut by the frost. Paspalum is the principal pasture, but owing to the dry, late autumn, winter, and early spring, with practically no good rains until the hot weather thunderstorms start in October, there is really no spring, and an almost entire absence of White clover in the pasture, such as is found in our paspalum pastures in New South Wales. Some tropical introduced grasses, such as Rhodes grass and Para grass, do well here, and in many respects, except for the drier atmospheric conditions during the cooler months, the Atherton Tableland has much similarity, not to our North Coast Tablelands (which are much colder), but to our North Coast district.

Main Reasons for Maize Storage.

This is so much so that adult weevil infest the maize crop at Atherton in the field before harvest, as on our North Coast, and although it does not do a great amount of damage during the winter, it is present in the invisible egg or larval stage to such a great extent that as soon as the weather again becomes more favourable in October, the weevil breeds apace and renders some form of storage necessary if maize is to be available for farm use or for the local markets from October till the following June. On this account the storage of maize in 1,500-gallon tanks, holding about 4½ tons (180 bushels) of shelled grain was already a recognised practice both on the farm and also at Cairns and Townsville before the advent of the silos. It has been found that maize could thus be effectively stored, provided it was sufficiently dry, which was roughly determined by experience; and although some mistakes were made with maize containing too much moisture, the storage of maize in this way was largely successful. Maize kept on the dry tableland during the winter eventually dried down by September or October to 12 or even as low as 10 per cent. moisture, which, of course, made it quite safe for storage in bulk.

* Report on visit of inspection to Atherton Maize Silos, May, 1925.

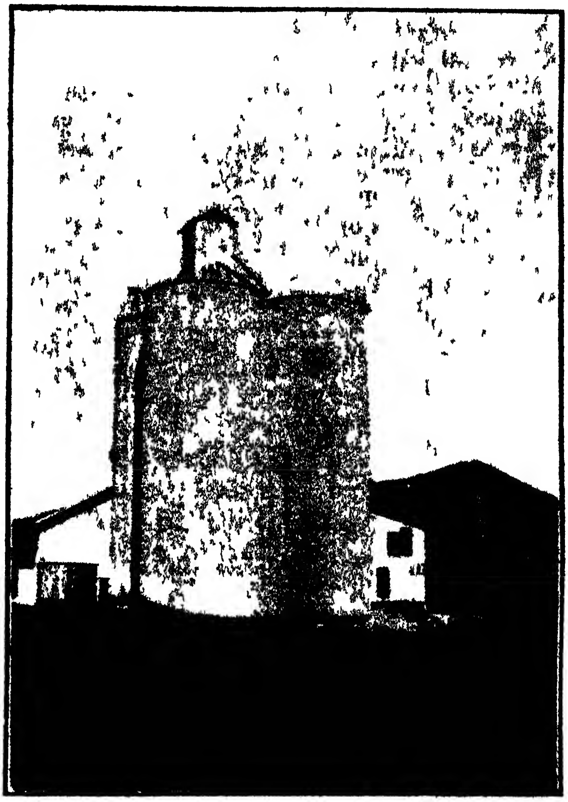
Successful Tank Storage.

In this tank storage it is interesting to note that not only on the tableland but also at Cairns and Townsville the maize was stored successfully without any fumigation or other treatment for weevil, which was abundantly present in the egg or larval stage at least, and sometimes as the live adult stage, when the grain was put into the tanks. By experience it has been found that if the tanks were *filled completely* and rammed in the final stages of filling to exclude all the air possible, and if they were then sealed or made *thoroughly airtight*, no treatment for weevil was necessary. This must be either due to the vital processes going on in the grain giving off sufficient carbonic acid gas to inhibit all insect life or to the need of the weevil for a continued supply of oxygen for its activity. It is observed that in these tanks the live weevils make their way to the top, apparently away from the heavier layer of carbonic acid gas at the bottom, or to the temporarily greater supply of oxygen at the top, and are eventually found dead in the top layer of grain when the tank is opened. Whatever the cause, the damage to the grain is apparently prevented by ensuring that the tank is deprived of as much air as possible by filling it completely and making it airtight. When the tank is not completely filled or not rendered airtight, weevils become active, and fumigation of some kind then becomes necessary. It remains to be determined whether the weevil in the maize is actually all killed by this storage or whether, if the tank is opened to remove some of the maize from time to time, it will become actively reinfested from the still possibly dormant insect life (*e.g.*, weevil eggs and larva) present in the tank; but to be on the safe side, fumigation in such case is advisable.

Tank Storage Inadequate for Atherton Farmers' Welfare.

Although apparently satisfactory methods of storage of Atherton maize were already in operation before the advent of the silos, circumstances were combining against the farmer doing so well from maize-growing as not to necessitate some change. In the first place, Atherton Tableland maize has mostly a natural market in North Queensland, which it is found desirable to keep from southern competition, there being a market in the north of Queensland for about 12,000 to 15,000 tons of maize annually, chiefly at Cairns and Townsville, to which Atherton is the nearest centre of production, the nearest other maize-producing area being South Queensland. Most maize-growers at Atherton, who do not combine stock to any extent with their farming, have usually to sell their crop at once to realise cash. The result was simultaneous and too hurried marketing of much wet maize by farmers, which has given Atherton maize a bad reputation, against which merchants and agents in Cairns and Townsville and in southern (even Sydney) markets defended themselves (often justifiably and sometimes unscrupulously) by offering Atherton maize (and securing it at) 6d. and 1s. per bushel less than the true market value at that time. In addition to this,

merchants in Atherton, Cairns, and Townsville stored about 8,000 tons, which was bought during the glut period, and on which, when prices rose after October, they were easily able to repay the cost of storage. Farmers did not generally have large individual storage accommodation, and were thus unable to get the higher prices for their maize which ruled from October to June. The farmers did not care to go to the additional heavy expense of providing larger individual storage accommodation, and even if they had they would not have been able to get any advance from the banks for maize stored on their own farms.



The Atherton "Nest" of Silos.

Necessity for Silos.

The primary objects of the silos on the tablelands were therefore to enable tableland growers to realise a portion of the value of their maize crop (on which they were largely dependent) soon after harvest, and to secure a better measure of the value of their maize, of which they were being too generally deprived by outside merchants. Seeing that storage of the maize on the tableland was only provided for by local merchants to the extent of 2,000 tons, there was direct need for the additional accommodation, and as the tableland merchants did not care about making available this additional bulk storage, largely on account of the danger of handling any but dry maize, the district generally took up the question of storage in silos, a necessary feature of which was to be the installation of drying apparatus to remove the excess moisture so as to render it safe for consignment or storage, which would finally remove the disability that good growers were suffering from by reason of the bad reputation of Atherton maize.

As its wet condition was the chief fault of the Atherton maize, the drying of early-marketed maize either for consignment or for storage was necessary, and this had to be done so universally that no wet maize should leave the tableland, and the stigma so removed that tableland maize would receive a fair and reasonable price in the future.

Apparent Reason for Compulsory Pool.

Had the silos remained under Government control and been used for storing maize on growers' account, negotiable warrants being used as in New South Wales, the financial disability of the farmers would have been largely overcome; but apparently the stigma attaching to Atherton maize could only be removed and the good farmer (who did not sell wet maize) go unpenalised, by control of the farmers in some way to compel them to have their maize dried if necessary, so that wet maize should never leave the tableland. With Government control of silos and handling on growers, account, maize going through the silos would probably in time have established such a superior reputation that farmers would have been economically compelled to voluntarily send their maize to the silos. Organisation, however, resulted in the formation of a compulsory maize pool under the recent Queensland act. The Chairman of the Board states definitely that, despite the somewhat heavy costs, the maize-grower at Atherton will come out far better than he would otherwise have done in a season of such heavy production throughout the State. With such low prices, southern Queensland maize came up to compete on this market, and did so for a time successfully, owing to the silos not being ready until July or August. Fortunately, owing to the pool, they were able to export 5,000 tons overseas at £7 10s. per ton Cairns, which would have been a burden on the local market; £4 10s. per ton has been paid to growers for first-grade maize (2s. 3d. per bushel), and they expect to wind up at an average of £5 per ton (2s. 6d. per bushel) on the farm. It seems rather likely that the wet or weevily maize from Atherton in such a season of heavy production as last season would have been a drag on the local market and would have had to rely largely on the Sydney market. The average Sydney price of 3s. 6d. per bushel which was ruling during the present season, is equivalent to about 2s. per bushel Atherton, which would have been 1s. 6d. or less per bushel to the tableland grower on the farm. So that even during the first season, the grower has apparently done better than he would have done without the silos.

System of Handling by Pool Board.

Although the success or otherwise of storage is not particularly dependent on the pool, the silos being managed by the Maize Pool Board makes the system of handling interesting. The pool, being compulsory, controls every bushel of maize produced for sale on the Atherton Tableland, so that no maize can be sold direct from the farm without passing through the pool.

The plan adopted by the pool is to reduce or raise the value of all maize received to a common basis of 14 per cent. moisture (which is considered safe for storage and consignment to any Australian market) so that any maize sold by the pool locally with perhaps a moisture content of 17 or 18 per cent. may not be unduly credited with a higher value. The practice at the silo is further to take a sample of the maize from the hopper by means of a 6-foot plunger and by means of sieves of the same size as are in the cleaning machine, to separate cracked grain, dirt, bits of cob, &c. (all included under offal, which is also valued) and to get the percentage by weight of clean grain, which is then tested for moisture and brought to the value of 14 per cent. moisture-content maize. This method differs from the South African and American

Method of Storing Maize in Tanks.

Formerly in Use at Atherton.

maize silos, in that in these latter the grain is actually put through the cleaner and the weight of whole grain then taken. This cannot very well be done at Atherton, because the pool must, and does, accept everything, irrespective of moisture content or insect, fungous, or weather damage. In South Africa the elevators will not accept maize containing over 12½ per cent. moisture; this is largely because the elevator system there is designed for bulk handling for export. Different circumstances surround the storage of maize in silos at Atherton (as previously explained), and as the pool must receive everything—not necessarily for storing, but for valuing—some form of grading in addition to mechanical examination and testing for moisture content was necessary.

Grades.

It was originally designed to have three grades, as follows :—

Grade 1.—Shall be cool, sweet, bright and free from live weevil. It shall weigh not less than 51 lb. per bushel, shall not contain more than 14 per cent. moisture, not more than 3 per cent. foreign material and cracked corn, and not more than 4 per cent. of damaged corn by weight.

Grade 2.—Shall be cool, sweet, and free from weevil. It shall weigh not less than 47 lb. per bushel, shall not contain more than 14 per cent. moisture, not more than 6 per cent. foreign material and cracked corn, and not more than 10 per cent. of damaged corn by weight.

Grade 3. If the sample were of less bushel weight than 47 lb. or contained more than 10 per cent. of damaged grain, or were musty and sour, it would be classed as No. 3 grade, or corn unsuitable for sale outside the tableland, and paid for on valuation by the manager. As a rule such corn would not be put into silos, and farmers are advised to keep "third-grade" corn for feeding to their own stock.

Actually in practice at Atherton last season there were only two grades made, grades 1 and 2 heretofore described being lumped together, and an advance of £4 10s. per ton on such maize by the pool, and on any maize not coming into this grade an advance of £3 per ton.

It will be seen that the pool, by the system of assessing the value on moisture content and on grade (which latter could with advantage be fixed more strictly), compels the poor farmer supplying a sample of high moisture-content and poor quality to be justly penalised.

Location and Size of Silos.

The silos—at each of the three centres, Atherton, Tolga and Kairi, only about 4 miles apart—are in the centre of what is known as the agricultural belt of the tableland, where maize-growing is carried on almost exclusively without stock. There is little doubt that the land has been over-boomed for this type of agriculture, and that in this area the present system will be forced by diminishing yields to change to more stock and less maize, which will throw maize-growing further out from the silos than at present. As Atherton accommodation is provided for 3,000 tons by four bins of 700 tont each and an interspace, and at Kairi and Tolga for 2,500 tons each, making a total storage accommodation of 8,000 tons. Only the Atherton silos have a drying plant attached to them, and much maize already has to come from other silos to them or await storage there until such a time as the moisture content is as low as 14 per cent. With a capacity of 3,000 tons the silos at Atherton actually handled 9,000 tons. This left about 7,000 tons between Tolga and Kairi, which between them have accommodation for 5,000 tons.

Transport to the Silo.

Transport from the farms to the silos is done, as stated, partly in bulk waggons and partly in bags by horse and motor lorries, but there is nothing but bag transport on rail, either to or from the silos. Trucks of bagged maize consigned to the silos by rail are not allowed by the railway authorities to run into the silo siding, which is several hundred yards from the goods shed from which delivery must be taken, and the cartage to the receiving platform of the silos costs 3s. per ton, an exceedingly bad and expensive arrangement. Bags are sewn for consignment or transport to the silos, no labour-saving devices for tying or fastening the bags having been considered.

From the waggons or trucks, the maize is tipped or emptied out of the bags into a weighing scale hopper of about 5-tons capacity. Here, after weighing, a sample is taken, by means of a 6-foot plunger, for examination and assessment of the dockage and net weight of whole grain, which is then graded. From the weighing scale hopper, the grain gravitates into a lower accommodation bin, from which it is elevated by a bucket elevator into a screw conveyor to be conveyed to the cleaner, then to the boot of the main elevator. It is possible that the horizontal carrying of maize in the silos could be quite as efficiently done by belt conveyors as it appears that screw conveyors are apt to crack and powder maize much more than belt conveyors would, and it is rather important to keep down the dust in maize storage.

The silos at Atherton alone have dryers and coolers installed, and at Kairi and Tolga the maize, once elevated into the bin, cannot be put back into the cleaner, although it can be turned. This is a serious fault, as every turning produces dust and cracked corn, which should be removed. All maize containing over 14 per cent. moisture has to be sent to Atherton to be put through the dryers, and when these dryers are in use the whole plant is run by a powerful steam engine (with wood fuel), too costly to use when smaller power for cleaning or turning is required, which is then provided by a kerosene oil engine. The dryers can reduce moisture content of the grain from 18 to 14 per cent. at the rate of 20 tons per hour. The system has complete control over the grain in the bins, being able to change it from one bin to another, or throw it into the dryer, cooler, cleaner (except at Tolga and Kairi), sacking platform, or railway truck at will. From the sacking platform a spiral chute throws the bags into the railway trucks or into a consignment room for loading into carts or waggons for local trade.

Turning in the Bins.

A plunger with thermometers indicates the temperature at different heights in the bin, and the experience has been that the normal temperature of the grain in storage is about 31 deg. Cent., and that when it rises to the vicinity of 34 deg. Cent. it is advisable to turn it.

An important point has been discovered in the storing of the maize at Atherton, viz., that heating of the grain in the bin always takes place if fresh

maize is placed too soon in contact with maize that has gone through the dryer, especially if the fresh maize contains more moisture than the dried grain. It seems necessary that a couple of days at least should elapse before any fresh maize is placed in contact with dried maize. For turning maize the selection of a day with dry atmospheric conditions—if possible in such a wet summer climate—decreases the need for later turning.

It is a very significant fact that at Kairi and Tolga, where the maize stored contained less than 14 per cent. moisture, little or no trouble was experienced with the maize heating in the bins. At Tolga it was found necessary to turn the maize only once (in one of the bins), and at Kairi, where the stored maize had a slightly lower moisture content on the average than at Tolga, it was found unnecessary to turn the maize at all during the whole period of storage of six months or more, and it is agreed that an excellent sample was turned out. Of course, the maize in the bins was fumigated for weevil, and was being moved out from time to time for consignment.

On the Atherton Tableland, maize dries out naturally by August or September to about 12 per cent. moisture, and the Pool Board advises growers to leave their maize standing on the stalk in the field as long as possible to facilitate the reduction of moisture to a minimum. There is little doubt that this encourages a bad farming practice in maize-growing, delaying the early ploughing that would ensure better yields. Nothing is known of the cheap, rough, but eminently successful kiln dryers used on farms in New South Wales to dry the grain for an earlier market. Under the system by which the value of maize received at Atherton is assessed, and corrected by weight up to 14 per cent. if below that figure, this kiln-drying on the farms would enhance the value of his maize to the individual farmer, as well as enable him to harvest his maize earlier and consign it to the silos, and so reap the advantage of an earlier ploughing.

Assessing and Grading.

A sample of the farmers' maize having been taken by means of the trying tube, it is divided roughly into two parts, one of which is kept for future reference in case of possible dispute; the other half of the sample is examined and tested on the spot. In this examination it is tested for moisture content, bushel weight, percentage of foreign matter and cracked corn, percentage of damaged and weeviled corn, and condition (mould, mustiness, &c.) and the net weight and grade of grain is determined.

Foreign matter and cracked corn is defined as all the material which will pass through a sieve with round holes three-sixteenths of an inch in diameter, and in addition such coarse foreign matter (bits of cob, &c.) as remain in the sieve. In the cleaner this offal comes out on fine screens, and is sold locally at an average price of 2s. per bag, which is credited to the pool.

Silo Certificates.

The weight of the grain having been determined, the silo manager gives the farmer a temporary receipt showing:—

1. The weight of maize delivered.
2. The percentage of moisture.
3. The percentage of foreign matter and cracked corn.
4. The percentage of damaged and weevilled grain.
5. Remarks as to condition.
6. Grade.
7. Percentage dockage on account of factors 2, 3, 4, and 5.
8. Docket weight on which the advance is to be paid.

This receipt is only a temporary one, because it is not practicable nor desirable to issue final documents for each waggon load or delivery of grain.

As soon as the farmer has delivered to the silo the quantity of grain for which he desires a final certificate, the temporary receipts are surrendered to the Secretary of the Maize Pool Board, who issues in exchange therefor, as soon as practicable, a certificate in the prescribed form. It is provided that the Board, if it has received notice of any mortgage, charge, lien, or encumbrance over, or contract relating to any such maize, may at its discretion refuse or withhold the issue of such certificate. When the maize is grown under a share-farming agreement, the Board may at its discretion issue a separate certificate to each of the parties to such agreement.

This final certificate is not transferable except by way of security approved by the Board.

Temporary receipts are issued and accepted subject to the regulations under the Primary Pools Products Act, 1923. The owner or his representative and the silo manager must sign the temporary receipt in triplicate.

Appeal against Grade.

If a farmer is dissatisfied with the grade fixed by the silo operator, he may on depositing a fee of 5s. to cover the expenses involved, demand that a further examination of the grain under dispute be made by himself and two members of the Board. If the decision of the Board members confirms the farmer's opinion of the grade, the fee of 5s. will be refunded and the corrected grade shown on the temporary receipt, but if the grade given by the silo manager is upheld by the Board members, the fee of 5s. will be retained.

In the busy season the silo manager has not always time to take a moisture test on the spot, and in this case the temporary receipt issued is of a different colour and is marked "Subject to moisture test" and a portion of the sample is sealed up for testing later. After testing, a further temporary receipt is issued cancelling the previous one.

Moisture testers (Brown Duvel) are stationed at each silo, and farmers are invited to send samples of their maize to the silo manager before shelling and transporting their maize to the silos.

Fumigation for Weevil.

Although, as previously mentioned, maize has been said to be successfully stored in full airtight tanks without fumigation for weevil, the conditions are different in the silos, where maize is constantly being taken from or added to the bins, and where fresh air is thus constantly being admitted. In such case the fumigation for weevil is absolutely essential. The Maize Pool Board at Atherton has pioneered in this respect. Realising that the destruction of weevil was necessary under their conditions of storage, the Board tried as little as 2½ gallons of carbon bisulphide to the bin, sealing the bin top and bottom. With a height of 70 feet of maize in the bin, this quantity, poured on the top of the grain was found to give gas diffusing strongly when the air screen was moved at the bottom two days later, and such fumigation was found to be quite successful. The practice now is to use even less than this quantity, about 1 to 1½ gallons per bin, supplementing this by a cupful or so when the maize is moved and fresh air admitted, or by proportionate amounts when any grain is added to the bin. Weevil is thus kept under control by fumigation at a cost of about one-thirtieth penny per bushel at most.

The danger of fire is, of course, ever present with carbon bisulphide, but no trouble has yet been experienced from this source. The danger to human life is insignificant, but knowledge of the presence of the danger is desired, and negligence should not be permitted. Carbon dioxide may prove better if it can be used as cheaply. The Board has not tried this, but is seeking a better fumigant (less attended by danger) as cheap as carbon bisulphide, and is making inquiries from America regarding carbon tetrachloride, which is said to be used for the fumigation of maize in bulk cars on rail there.

Advantages of the Silo System at Atherton.

Silos for handling maize in Australia cannot at present, nor probably at any time, be looked on as a cheaper means of transport and saving of bags, as with the bulk handling of wheat, because of the absence generally of an export trade. (Though some Atherton maize was exported overseas from Cairns last season, that is not likely to happen often, because of the general disadvantage in price, and it is not worth while making provision for handling in bulk for export under the circumstances).

Nevertheless, the silo system for storing and handling at Atherton appears to have the following advantages over the old system of handling :—

1. Safe storage on a large scale, with avoidance of much loss and deterioration of grain.

   Under these heads, there is an increased return to the farmer, firstly because of a better price for much of the maize, which he previously marketed early, and which contained too much moisture, and also, as pointed out, a much better price for the good farmer who marketed dry maize, and who often only received for it the low

price commanded by damp maize. In addition, there is avoidance of the loss which formerly took place on the farm, owing to the farmer having to choose between a forced sale and deterioration, due to insufficient storage accommodation, and therefore being being unable to take advantage of the higher price after October.

2. Improved facilities for financing the farmer, taking him out of the hands of the country storekeeper, who is also mostly glad to be relieved of the burden of carrying the farmer.

3. Improved facilities for cleaning, drying and conditioning the grain, for which an enhanced price is returned to the grower, which in the case of Atherton maize is apparently going to be well worth while. Such drying and conditioning of the grain is absolutely necessary with some maize for safe storage.

4. The receiving of maize only of good quality or the grading of all maize at the silo tends to improve the standard of farming in the district.

5. Improved facilities for pooling which, if managed successfully, is of further benefit to the farmer.

6. Greater ease and more satisfaction to buyers at a distance because of better standardisation of quality.

7. Probably lessened cost of loading into railway trucks and less vexing risks and losses in transit.

The advantages of silo systems generally which are not apparent at Atherton are—(1) saving of bags, (2) more effective handling and transit (for export) in bulk, (3) saving of space at rail and port, and (4) elimination of disputes regarding weight and quality. This last would be a factor if silos were under Government or railway control, but with the exception of the first mentioned these advantages of silo systems are of somewhat minor importance.

Some of the above advantages would not apply to the storage of maize in silos in New South Wales, but in some districts in this State other local advantages which are not apparent or are not considered at Atherton, would occur.

The advisability of silo storage for maize must be determined largely by local considerations. With an export trade, or with bulk handling (and consequent saving in cost of bags), grain silo systems may be considered as links in the chain with the terminal market, as with wheat in New South Wales, or with maize in South Africa. As export or bulk handling is not likely to be of general significance in the maize industry of Australia in the near future, urgent local necessity, as on the Atherton Tableland, must be present for the success of silo storage in any district.

Tumut Maize-growing Contest.

E. S. CLAYTON, H.D.A., Agricultural Instructor.

LAST season a maize-growing contest was inaugurated by the Tumut Agricultural Society. Fourteen entries were received, including two that were non-competitive by the Department of Agriculture. The aim of the contest was to determine the highest yielding strain of maize for the district and to foster a competitive spirit in the systematic selection of seed maize.

The entries were planted on 30th October, on a rich alluvial soil on Mr. F. T. Dowling's property at Tumut Plains. The rows were 3 feet 8 inches apart, and two rows of each variety were sown.

Numerous heavy showers of rain were received during the growing period, but, unfortunately, the weather throughout was much too cool for the production of very heavy yields of maize. The summer was quite unusual, and the yields in consequence were not so high as those obtained in this distric in normal years. Numerous frosts were recorded, occurring both late and early, and the growing period was shorter than usual.

The crop was well cultivated and kept quite free from weeds. Harvesting took place on 22nd June and the varieties were then weighed. The moisture content of the maize was determined and the yields computed.

Name and Address of Competitor.	Variety.	Yield per acre.	
		bus.	lb.
F. T. Dowling, Tumut Plains ...	Golden Surprise	57	48
J. T. Calloway, Upper Gilmore	Early Clarence	56	42
F. T. Dowling, Tumut Plains ..	Early Clarence	46	49
Department of Agriculture	Craig Mitchell	41	8
H. Godfrey, Gocup	Early Clarence x Yellow Mastodon..	40	28
W. H. Foord, Bembowlee	Yellow Mastodon	40	28
J. C. Hargreaves, Blowering	Early Clarence x Red Hogan	39	48
A. N. Stacy, Tumut	Murrumbidgee White	35	20
Department of Agriculture	Funk's Yellow Dent ...	35	20
Butler Brothers, Bembowlee	Early Clarence	35	17
W. Butler, Gilmore	Coodra Vale ..	30	48
J. Atkinson	Early Clarence	27	41
W. H. Foord, Bembowlee	Red Hogan	27	11
F. T. Bourke, Tarrabandra	Early Clarence	23	41

It should be borne in mind in reviewing these results that the cool summer was more suited to the early than to the later maturing varieties, some late-maturing strains and varieties suffering considerably from the effects of the season.

Golden Surprise is an early variety of maize, which is very similar to the well known Golden Superb of the coast. It has found considerable favour in the Tumut district for sowing towards the end of November or in December, when it is too late for the main crop to mature properly.

Such contests need to be continued over several years to get a fair indication of the best yielding varieties or strains of maize.

The Value of Fallowing for Wheat.

Some Further Data About the 1924–25 Season.

In the June issue of the *Agricultural Gazette* a table was published which showed the average production of wheat at last harvest for the various districts into which the State is divided for statistical purposes. The Acting Government Statistician has now prepared a further interesting statement, showing the figures in greater detail as to the districts, and we publish them in the hope that they will convince still more farmers of the profitableness of fallowing as a system of farming, by drawing attention to the results in their own localities. This has been done by showing the figures actually collected in a large number of police patrols in which a substantial amount of wheat is grown.

The season 1924–25 was very favourable and the yield per acre for the whole State was above the average, but even under these conditions the results obtained from fallowing have been surprising. In an unfavourable season fallowing may be expected to give still better results.

In the Riverina the production from fallowed land was 45 per cent. greater than from stubble land, and in the South-western Slopes 42 per cent. In the more northern and central divisions, where fallowing is not so extensively practised, the results were as low as 18 per cent., but even this represents an increase of nearly 3 bushels per acre. Some remarkable discrepancies between the yields in neighbouring patrols are disclosed. At Wellington there was only an 8 per cent. advantage attaching to fallowing, whereas at Geurie there was 19 per cent. advantage, at Dubbo 21 per cent., and at Mudgee 56 per cent. Evidently seasonal variations within even such a comparatively narrow area were considerable. However, the fact that fallow almost everywhere gave an increased yield, and in a very large number of patrols over 20 per cent. advantage, is sufficiently instructive.

In the following statement all fallow land is included whether it lay fallow for a full year or for the summer only, and to the variation in period of fallowing and to the extent to which manures were used may be ascribed the differences in the results.

The table shows the area sown with wheat for grain on each class of land, the average number of bushels per acre obtained, and the increased production from fallow land as compared with stubble, in the principal police patrols of each division during the season 1924–25.

AREA and Production under Non-fallow and Fallow Conditions.

Divisions and Police Patrols.	Area harvested for grain.			Average production per acre.			Increased yield per acre of fallow land over stubble land.	
	New Land.	Fallow Land.	Stubble Land.	New Land.	Fallow Land.	Stubble Land	Actual.	Per-centage.
	acres.	acres.	acres.	bus.	bus.	bus.	bus.	
Total, Coastal Division ...	780	352	2,129	9·8	12·8	10·9	1·9	17
Northern Tableland Division	28	11	3,594	25·7	30·0	23·1	6·9	30
Central Tableland Division—								
Bathurst	...	2,714	836	...	27·3	24·1	3·2	13
Carcoar	147	1,796	1,112	27·5	18·6	18·1	0·5	3
Cowra	...	20,389	14,957	...	22·9	20·5	2·4	12
Goolagong	54	1,016	5,917	23·9	20·0	18·6	1·4	8
Gulgong	343	998	13,626	13·3	18·9	14·8	4·1	28
Leadville	404	852	10,450	11·1	15·2	11·5	3·7	32
Millthorpe	...	1,887	59	...	16·6	11·7	4·9	42
Mudgee	70	961	7,174	18·2	22·4	14·4	8·0	56
Wellington	...	11,678	40,301	...	18·8	17·4	1·4	8
Woodstock	590	2,231	5,462	13·6	21·1	15·3	5·8	38
Other Police Patrols ...	769	7,324	6,632	15·8	21·2	14·0	7·2	51
Total, Central Tableland—	2,377	51,846	106,526	15·1	21·2	16·5	4·7	28
Southern Tableland Division	163	4,765	4,526	18·6	19·1	16·1	3·0	19
North-western Slope—								
Carroll	50	1,400	13,410	9·0	25·0	19·8	5·2	26
Curlewis	300	2,542	14,116	21·2	17·5	12·1	5·4	45
Currabubula	23	1,216	17,312	12·8	15·3	12·6	2·7	21
Deluagra	380	60	18,090	26·0	22·5	19·3	3·2	17
Gunnedah	1,390	946	30,511	15·6	16·3	12·7	3·6	28
Inverell	107	1,693	17,984	34·4	20·8	20·1	0·7	3
Manilla	567	1,311	29,300	16·8	24·4	19·9	4·5	23
Mullaley	845	602	12,428	11·5	16·1	12·7	3·4	27
Somerton	1,563	1,310	28,381	12·0	19·7	16·8	2·9	17
Tamworth	380	7,520	46,162	16·9	18·7	16·5	2·2	13
Other Police Patrols ...	2,256	3,192	75,593	14·0	19·8	16·2	3·6	22
Total, North-western Slope...	7,861	21,792	303,287	15·1	19·3	16·4	2·9	18
Central-western Slope—								
Alectown	3,338	12,789	19,251	18·6	19·3	15·1	4·2	28
Canowindra	·3	12,816	21,171	15·0	21·6	16·9	4·7	28
Dubbo	1,962	7,928	47,436	15·5	18·7	15·5	3·2	21
Eumungerie	3,842	5,552	24,867	15·8	21·2	15·1	6·1	40
Forbes	2,035	26,300	33,301	15·8	18·3	13·5	4·8	36
Geurie	120	33,964	24,978	17·5	16·0	13·4	2·6	19
Gilgandra	5,045	4,525	49,577	17·4	19·7	15·2	4·5	30
Gulargambone	2,561	5,861	19,610	12·1	16·2	10·5	5·7	54
Narromine...	3,024	11,004	70,083	13·9	15·8	13·7	2·1	15
Parkes	1,415	26,501	30,556	19·4	21·9	16·1	5·8	36
Peak Hill	6,393	11,497	35,959	18·0	16·8	14·4	2·4	17
Tomingley	1,820	4,330	21,590	20·0	23·8	16·8	7·0	42
Trundle	730	23,920	46,380	16·6	20·6	16·8	3·8	23
Other Police Patrols ...	6,710	37,689	166,694	13·2	19·7	13·8	5·9	43
Total, Central-western Slope	38,998	224,676	611,453	16·1	19·1	14·6	4·5	31

Area and Production under Non-fallow and Fallow Conditions—*continued.*

Divisions and Police Patrols.	Area harvested for grain.			Average production per acre.			Increased yield per acre of fallow land over stubble land.	
	New Land.	Fallow Land.	Stubble Land.	New Land	Fallow Land.	Stubble Land.	Actual.	Percentage.
South-western Slope—	acres.	acres.	acres.	bus.	bus.	bus.	bus.	
Ariah Park	160	35,007	10,734	15·2	18·9	10·5	8·4	80
Barmedman	...	55,045	11,887	...	21·1	12·5	8·6	69
Bimbi	350	9,405	19,310	10·9	22·5	18·4	4·1	22
Grenfell	1,301	34,050	14,329	11·4	20·0	14·8	5·2	35
Marsden	1,151	8,540	23,505	16·8	19·9	15·4	4·5	29
Temora	1,795	76,596	15,759	19·9	19·9	11·9	8·0	67
Ungarie	9,348	20,691	36,654	12·5	13·3	10·9	2·4	22
Wagga Wagga	693	36,724	6,488	23·0	20·0	11·9	8·1	68
Wyalong	3,884	47,317	26,039	18·4	17·8	14·4	3·4	24
Yalgogrin North	6,232	13,190	12,227	14·8	17·7	12·5	5·2	42
Other Police Patrols ...	4,247	204,702	87,248	16·4	20·6	14·9	5·7	38
Total, South-western Slope..	29,161	541,267	264,180	15·2	19·8	13·9	5·9	42
North Central Plain—								
Baan Baa	...	4,580	11,915	...	21·7	17·7	4·0	23
Baradine	1,668	631	7,634	12·0	16·5	14·7	1·8	12
Binnaway	307	1,212	6,574	13·6	20·0	11·0	9·0	82
Boggabri	1,126	150	29,863	8·6	24·0	17·1	6·9	40
Coonabarabran	1,337	472	8,998	12·3	16·0	11·7	4·3	37
Mundooran	1,216	2,223	19,998	14·2	22·3	12·2	10·1	83
Narrabri	635	610	15,932	15·5	14·6	14·6	...	...
Other Police Patrols ...	490	1,721	16,615	17·0	13·7	18·4	(–)4·7	(–)26
Total, North Central Plain...	6,779	11,599	117,529	12·7	19·6	15·3	4·3	28
Central Plain—								
Bogan Gate	1,634	22,961	33,245	22·4	20·3	17·5	2·8	16
Cargelligo	14,630	13,000	6,229	9·8	13·6	12·1	1·5	12
Condobolin	1,320	2,517	18,912	12·3	14·7	11·4	3·3	29
Fifield	2,191	3,030	13,097	13·3	16·8	13·3	3·5	26
Tottenham	20	1,095	4,897	9·8	11·2	9·2	2·0	22
Tullamore	860	2,220	12,057	6·9	16·0	11·5	4·5	39
Other Police Patrols ...	25	385	4,374	9·0	6·5	8·6	(–)2·1	(–)24
Total, Central Plain... ...	20,680	45,208	92,811	11·2	17·3	13·6	3·7	27
Riverina—								
Ardlethan	5,341	55,392	30,679	18·1	19·0	13·2	5·8	44
Barellan	7,635	52,097	41,535	11·5	15·9	10·3	5·6	54
Berrigan	2,103	32,978	2,180	21·3	25·0	17·4	7·6	44
Boree Creek	1,083	24,305	12,635	19·1	18·9	13·0	5·9	45
Coolamon	...	29,033	6,000	...	27·8	24·0	3·8	16
Finley	625	30,185	7,753	23·3	22·4	14·2	8·2	58
Ganmain	140	30,036	5,364	18·4	18·3	12·7	5·6	44
Grong Grong	2,050	21,623	9,610	18·6	18·2	11·9	6·3	53
Henty	165	20,495	7,541	12·8	21·2	15·0	6·2	41
Lockhart	190	31,915	2,215	14·2	16·7	12·8	3·9	30
Marrar	...	34,505	100	...	18·3	9·0	9·3	103
Mulwala	833	35,611	5,801	25·5	21·2	14·6	6·6	45
Narrandera	1,170	9,794	20,807	14·5	18·4	14·3	4·1	29
The Rock	20	32,085	6,449	15·0	21·2	13·8	7·4	54
Urana	2,017	12,128	13,018	15·3	20·9	15·2	5·7	37
Walbundrie	188	26,385	6,707	18·2	20·9	13·6	7·3	54
Other Police Patrols ...	18,542	202,136	93,078	14·7	19·7	14·9	4·8	32
Total, Riverina	42,102	680,703	271,472	15·6	20·0	13·8	6·2	45
East of Darling	965	828	2,557	2·4	9·5	4·3	5·2	121
Total, New South Wales	149,894	1,583,047	1,780,069	14·8	19·7	14·8	4·9	33

Variety and Manurial Trials with Maize.

Variety and manurial trials with maize were carried out last season on the property of Mr. E. J. Allen, at Gregra. The land (a red loam) had grown wheat in 1923. It was springtooth cultivated in January, 1924, mouldboard ploughed and harrowed in August, springtoothed again in September, and sown with the drill on 14th October, with three to four grains 30 inches apart in rows 6 feet apart.

The germination was fairly good, and the early growth fair. The crops did very well until tasselling, when a spell of dry hot weather injured pollination. The plots were harvested in March, 1925, with the following results:—

Results of Variety Trial.

Variety.	Yield per acre. bus.	lb.
Kennedy	16	45
Early Morn	16	31
Wellingrove	14	16
Iowa Silvermine	12	4
Funk's Yellow Dent	11	43
Yanco Crossbred	8	8

The variety trial was manured with superphosphate at the rate of 35 lb. per acre.

Results of Manurial Trials.

Superphosphate per acre.	Yield per acre. bus.	lb.
35 lb.	16	31
75 lb.	13	27
112 lb.	13	10
No manure	12	49

The variety used in this trial was Early Morn. The land had received a dressing of 56 lb. of superphosphate per acre the previous season.—H. Bartlett, Senior Agricultural Instructor.

Trials with Sulphur as a Top-dressing at Yanco.

Experiments have been conducted in two seasons at Yanco Experiment Farm with sulphur as a top-dressing. A lucerne stand was chosen for the purpose, and applications were made of sulphur only and of sulphur and superphosphate together. The only definite conclusion that can be arrived at is that sulphur alone as a fertiliser for lucerne is a failure. The first season's results seemed to indicate certain possibilities in the use of sulphur and superphosphate combined, the comparisons being made with unfertilised plots, but the second season the comparisons were made with plots that had been top-dressed with superphosphate, and the previous season's results were not confirmed. The yields from the sulphur and superphosphate plots showed a slight increase over the checks (which had been top-dressed with superphosphate only), but they had the residual effect of the previous year's top-dressing, and allowing for differences due to local variations in the soil, &c., the increase in the yields of these plots is not commensurate with the extra expenditure incurred, and not consistent enough to warrant the recommendation of the practice of applying sulphur as a top-dressing to lucerne.—R. J. Davidson, H.D.A., Experimentalist.

Points about Pit Silos.

Some Experience in the West.

B. M. ARTHUR, H.D.A., Agricultural Instructor.*

In times of drought it is a moot point whether the pecuniary loss to the man on the land, be he farmer, dairy-farmer or grazier, is not greater in the aggregate from the loss of stock by feed and water shortage than by crop failures. In the case of a failure of the staple crop, the farmer is only out of pocket to the value of seed and manure used, horse feed, and time lost, but where stock, such as sheep, horses, and cattle, die from starvation the monetary loss is a real one and replacement often difficult, even if the person concerned has the necessary wherewithal to purchase his requirements—in which case he has not the Rural Industries Branch to assist him.

Ensiling crops in pits is indisputably the cheapest and easiest form of fodder conservation, excepting perhaps the storage of grain, and it has the added advantage that the fodder is safe from fire and mice damage. As silage is not usually a saleable commodity, the owner is not tempted by the offer of lucrative prices to sell, as is often the case with stored hay or grain.

Several farmers and graziers in the central west put down and filled pits during the past season in localities such as Wellington, Dubbo, Narromine, Peak Hill, Gilgandra, &c. It seems only necessary to prevail on one or two individuals in each locality to put down and fill silage pits, and, with the advent of a dry time, the advantages of having stored silage will be realised by neighbours. It is usual to find silage-makers in groups, one man having perhaps commenced some years ago and the others having followed suit on realising the success of the method.

By conversation with men who have filled pits for some years, and by personal observation, several points in connection with the work of filling and emptying pits have appealed to me as being possible improvements over the usually accepted methods.

It is noticeable that the general tendency of the novice in silage-making is to make the pits deeper and wider than is advisable. In fact, one case came before my notice recently of a farmer who had excavated a pit 10 feet square and 10 feet deep by pick and shovel, and knew of no other way until put on the right track. But experience soon teaches that deep pits increase the labour of filling and emptying, and the trend of the experienced is towards even shallower pits than is usually recommended, and the quality of the silage turned out seems to be good. The excavation is usually carried out by the owner himself, but several cases have come before my notice where pits have been put down by contract at from 1s. to 1s. 6d. per cubic yard.

* Extracts from a paper read at a conference of Agricultural Instructors of the Department of Agriculture, Sydney, 30th June, 1925.

Wheat, oats, or barley are generally used, but in one case last season silage was successfully made from a mixture consisting mainly of variegated thistles. My advice was asked by a farmer who had sown 10 acres of lucerne on the Macquarie River flats as to how he could best get rid of a tremendous crop of thistles which had come up with the young lucerne plants and which was threatening to kill out the lucerne by excluding the sunlight. This thistle crop was estimated to be at least 10 tons per acre. I suggested that he kill two birds with one stone by cutting the thistles and lucerne with a mower while green, and putting the mixture into a silage pit. As there was a possibility that the material would be too sappy and became mushy, about 10 acres of a wheat crop was cut and put in with the thistles, in the proportion of one load of wheat to two of thistles. The resultant silage has proved to be excellent.

Most of the cereal crops are cut with a binder. There are differences of opinion as to the best methods of filling the pit. Some advocate putting the sheaves in crossways, the contention being that it makes for easier work in emptying, as one is able to pull the sheaves out whole by the binder twine band. The method does not appear to affect greatly the settling-down of the material.

A good point that came under my notice, and that was gained by experience by two silage-makers of several years standing, is that in building up the pit above the ground level the height should be made to correspond to the depth of the pit, *i.e.*, where the pit is, say, 6 feet deep, the material should be stacked 6 feet high, and it is then sloped off accordingly to the slope of the batter. It has also been found that there is often a tendency for a shrinkage of the material away from the walls of the pit, allowing the covering earth to crack and open and permit run-off water to get down the sides during rain; this, together with the air so admitted, tends to spoil a greater percentage of the silage than is usual in well-filled pits. In order to avoid this, the plan of overlapping the sheaves about 6 inches over the sides of the pit when building up above the ground level has been adopted. Then the main mass of the material, on settling down by its own weight, drags this overlapping material in and down the sides and thereby prevents any undue shrinkage away from the walls.

A method of lessening the work when covering the material with earth was gleaned from two or three silage-makers. When topping off the portion stacked above ground level, it is built somewhat similar to a haystack, and a final double row of sheaves is overlapped along the ridge. The earth excavated from the pit is first dumped along this ridge by means of a bucket scoop, putting sufficient on to bind the mass thoroughly, taking the earth up from the ends. Then the balance of the covering is done from the sides, commencing at ground level, and putting each successive scoop full on top of the preceding one, working from each side alternately, until the material is covered with a sufficient layer of earth. This method tends to make the work of covering the pit less tedious than when all the earth is taken up from the ends, which is the usual method adopted.

Grain Sorghum Variety Trials.

North-western District.

C. McCAULEY, Agricultural Instructor.

Grain sorghum variety trials were carried out during the season 1924-5, in co-operation with the following farmers:—

J. Newnham, Wee Waa.
N. W. Webb, Wee Waa.
Dr Park, Eulah Creek, Narrabri.
J. Reece, Bingara.
S. McDonald, Gunnedah.

Wee Waa (J. Newnham).—Soil, sandy loam. The land was disc-ploughed on 20th August, springtooth cultivated and harrowed on 6th September. The seed was sown early in October at the rate of 4 lb. per acre, in rows 3 feet apart. Superphosphate was applied at the rate of 100 lb. per acre. The seed-bed was in a moist, clean condition. Considering the dry, hot weather experienced during January and February the yields were satisfactory. White Yolo produced the highest yield of grain. Kaffir and Darso also yielded well. Owing to poor germination, the yield of Feterita was considerably reduced. Milo shelled and lodged badly.

Wee Waa (N. W. Webb).—Soil, sandy loam. The land was well prepared and in excellent tilth. Seed was sown early in October at the rate of 5 lb. per acre, in rows 3 feet apart. Superphosphate was applied at the rate of 100 lb. per acre. All varieties germinated well and made good growth. Unfortunately the grain was destroyed by birds before it was ripe, consequently the yields were not comparable. Milo and Feterita would have yielded very well.

Narrabri.—Soil, alluvial loam. The land was ploughed during the first week of July, cultivated mid-August and the first week of September, cultivated crosswise on 2nd October, rolled and harrowed the third week of September. The seed was sown on 2nd October at the rate of 4½ lb. per acre, in rows 3 feet apart. No manure was applied. All varieties yielded well, but the yield from Milo was greatly reduced owing to the plants shelling and lodging.

Gunnedah.—Soil, sandy loam. The land was ploughed on 12th September and harrowed on 21st September. The seed was sown on 20th September at the rate of 4 lb. per acre, in rows 3 feet apart. No manure was applied. All varieties except Feterita germinated well, and made fair growth. The grain was harvested satisfactorily with a header. A large amount of Milo grain was lost, owing to the plants shelling. Considering the dry season these yields were most satisfactory, and prove the drought-resisting qualities of these sorghums. Maize sown in this district last season under similar conditions was a failure. The low yield of Feterita was due to its having germinated very badly.

Bingara.—Owing to cold, wet conditions at sowing time the seed failed to germinate.

Seed was also forwarded to Messrs. L. Latham, Baan Baa, and A. Bailey, Gunnedah, but owing to the adverse conditions at sowing time the seed is being held over till next season.

RESULTS of Variety Trials.

Name.	Kaffir.		Feterita.		Milo.		White Yolo.		Darso.	
	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.
Wee Waa (J. Newnham) ...	17	10	7	30	8	20	15	30	10	24
Narrabri...	36	40	44	0	33	0	29	20	42	10
Gunnedah	.....		7	0	16	0	26	40	28	42

RAINFALL Records.

	Gunnedah.	Wee Waa.
	Points.	Points.
September	90	120
October	119	75
November	731	840
December	202	140
January	170	160
February	14	20
Total	1,326	1,355

TO SAVE 340,000 DOLLARS.

BY complete co-ordination of all packing operations it is estimated that a minimum of 340,000 dollars annually will be saved to the raisin growers of California, according to advices received by the Bureau of Agricultural Economics, U.S.A. Reduction in the cost of plant supervision, elimination of non-productive labour, lessened expenses for equipment, insurance, and repairs, a saving in the depreciation and replacements of machinery, and a consolidation of the work of inspection, are some of the items which contribute to the savings effected in the operating department.

The consolidation was made possible in part through a unique change in the sales procedure of the association. Formerly sales were made only for the current and succeeding months, and the larger portion of these orders were generally held back until the last days of the month. As a result, many of the plants were overloaded for a few days each month in the fall, when shipments were heaviest.

The sales organisation has now divided the country into two equal parts. In one section the association's selling month is the calendar month, and in the other it runs from the fifteenth of one calendar month to the fifteenth of the next. This device, the association reports, was entirely acceptable to the trade, and immediately reduced the operating peaks by 50 per cent.—*Federal Department of Markets and Migration, Melbourne.*

Dairying Under Irrigation in N.S.W.

P. WALLER, Dairy Instructor.*

UP to the present time dairying has constituted the chief industry on the Murrumbidgee Irrigation Areas. Its importance (and growth) may be gauged from the fact that the turnover of the local co-operative dairy company for the twelve months ending 30th June, 1925, was £115,000 as compared with £8,000 in 1915. The number of prizes won by this factory in both England and Australia proves what an excellent article can be made here, while the demand for this butter in ordinary trade channels proves its worth as a commercial product. At the present time there are 441 dairy farms on this area, ranging from 100 to 400 acres, with an aggregate area of 82,000 acres, while at least twice this area is available for future settlement as required.

It is only to be expected that a comparatively new branch of agriculture like dairying under irrigation should have its own special problems, some of which may take years to solve. During this period of evolution more or less hardship is sure to be experienced by those engaged in the industry. Any form of irrigation farming always demands the application of intensive methods in order to secure the fullest benefits from a regular supply of soil moisture. Such a system of dairy farming may be said to involve "Seed, feed, weed and breed," or, to employ more definite terms—

(a) A well-planned rotation of crops, giving due consideration to green manuring.

(b) Fodder conservation and stall-feeding of dairy stock.

(c) The general adoption of systematic herd-testing and culling of unprofitable cows.

(d) The use of pure-bred bulls of proved production strains.

Rotation and Green Manuring.

The rotation of crops and green manuring are of supreme importance, for while they enable the farmer to produce the most suitable crops to balance rations, they also assist him to maintain fertility and the proper mechanical condition of the soil, both of which are essential for successful farming.

The above question has a much greater bearing on the success of dairying in these areas than is generally recognised, because it is the only practical means by which the deficiency of humus in these soils can be corrected. The best dairy lands of this State, whether scrub or alluvial soils, are rich in humus, while the soils of these western plains are deficient in this very necessary constituent, because they are formed in localities

* Paper read at the N.S.W. Co-operative Butter Factory Managers and Secretaries Association's Conference Sydney, 1925.

which never had the luxuriant forest growths of the coastal districts. In addition to this, the contour of the plains affords no protection against the scorching winds, which have swept them for centuries and destroyed much of their already limited supplies of humus. This deficiency must be supplied by intelligent farming practice, so that while the needs of the farm animals are supplied, at least a portion of the crops should be ploughed in to supply the organic matter necessary to support abundant crop growths and for soil renovation, which latter must never be lost sight of in good farming. At the same time, the significance of gypsum and other agents for soil amelioration must not be forgotten, nor their value as a means of producing heavier crops in the rotation.

Fodder Conservation and Stall Feeding.

Fodder conservation is a most important phase of intensive dairy-farming, because it ensures an adequate reserve of food. In this connection, silage is undoubtedly the best form of bulk feeding material, and when fed in conjunction with lucerne hay a well-balanced and highly satisfactory ration is assured. Silage can be made from such a variety of crops—maize, sorghum, Sudan grass, millet or winter cereals—that a suitable one may be obtained for any season or district.

While stall feeding may mean increased cost for plant, it is justified by the increased yield per acre, because the practice of "grazing off" crops, particularly while soils are wet, is very wasteful. Moreover, in wet weather, stall feeding is imperative, because the land is too wet to permit of cutting and carting the crop off the paddocks. It is during such times that fodder thrown on the ground is wasted by stock trampling it into the mud.

Herd-testing.

The herd-testing unit already in operation at Leeton is proving of genuine value to our farmers by showing the relative value of the individual production in each herd, and while there are some excellent cows here, there are also some which are not worth keeping. This goes to demonstrate that herd-testing is truly the accountancy of dairying. Farmers should fearlessly cull and sell for beef all unprofitable cows.

Pure-bred Sires.

On these farms, where the herds are necessarily smaller, it is essential to have cows which are heavy producers. It is seldom that such cows are offered for sale, and they always command a fancy price. Hence, it is essential for the farmer to breed them. This can only be done by using pure-bred sires of proved high production strains.

Shortage of Timber.

The scarcity of timber on this area is unfortunate for the dairy-farmer, because of the lack of shelter for stock, timber for fencing and out-buildings and firewood for dairy purposes. It seems certain that the systematic planting of belts of shelter trees will have to be adopted to protect animals

from the sun and flies in summer and the wind and rain during winter. An acre of good shelter trees on these plains will conserve more animal heat and energy for the dairy herd than could be produced from an acre of good lucerne land.

Firewood is scarce, and many farmers are averse to using sufficient to boil ample supplies of water for thoroughly washing dairy utensils. The writer has proved a big proportion of second-grade cream to be due to the fact that cold or insufficiently heated water was used for this purpose. With the growth of large towns on the area, the shortage of firewood is becoming acute, so that where ample belts of shelter trees are planted the timber obtained from lopping these will in a few years become a valuable asset. In addition, valuable fencing timber would soon be obtained from the judicious thinning of them. Fencing timber is already a very costly item here, but it is a constant need on the farm for renewals, subdivisions, pig-sties, &c.

Watering Stock.

The existing system of watering stock from earth tanks is not commended, these tanks being quickly polluted by the excrement of the animals which use them, and by the surface drainage when the adjacent land is flooded. Too often we see cattle drinking from such tanks when the water is dirty and stagnant; some farmers even use this water for washing dairy utensils, with consequent contamination of the cream. The position is improved if, when the earth is being scooped out, it is placed all round the outside of the tank, thus preventing the inflow of surface water. It is not uncommon to see tanks very boggy around the sides. This causes a good deal of straining and twisting for the cow when turning to walk out, and has often been suspected of causing abortion—there are times during the period of gestation when this might the more easily occur.

When these earth-tanks are used for dairy stock, they should be fenced off and the water pumped by a small windmill into an overhead tank for the supply of troughs. There will thus be made available wholesome drinking water for all stock, as well as a convenient supply for washing the bails and spraying the yard to lay the dust prior to milking.

Cream Quality.

It is apparent that our dry atmosphere is more favourable to the keeping quality of cream than the more humid atmosphere of the coast, doubtless owing to the fact that the dry conditions do not favour bacterial development.

The commonest food taints found in cream on this area are from lucerne, the common trefoil, Cape weed (*Cryptostemma calendulaceum*), stink weed, or goose grass (*Chenopodium ambrosioides*), and the plant locally known as stick weed (*Aster dumosus*). In the case of the first, a big improvement could be made by not allowing the cows to graze on this crop within two hours of milking. In all cases a big improvement would be made by running

the cream over an approved type of cooler as it leaves the separator; at the same time, the cream would be so reduced in temperature that its keeping quality would be greatly enhanced.

Pig Farming.

Although most farmers keep a few pigs, it is a branch of the industry which is greatly neglected, and leaves ample room for development along right lines. The local co-operative factory, which is capable of treating 200 pigs per week, cannot procure half its requirements locally, and so has to buy pigs outside the area. In addition to the local factory, the markets of Sydney and Wagga are prepared to take an almost unlimited number of both fat and store pigs.

Markets and Prosperity.

Because of its central position, this area has good local markets in the large southern and western towns, which enable the local factory to pay a higher price to its suppliers than the factories on the coast. In this way the higher cost of production is off-set. During the winter months the demand cannot be met; hence the advisability of arranging to bring cows to freshen for winter milking.

During winter and spring our natural pastures are at their best, and as our spring is at least two months earlier than on the coast, it behoves our dairymen to avail themselves of the advantage this offers them to secure maximum prices for their heaviest production at a period when it is easiest to produce "choicest" cream. Winter and spring dairying gives the farmer more time to attend to fodder conservation, watering of his crops and other work incidental to summer.

That there is ample room for the expansion of dairying under irrigation cannot be denied, and suitable western country under irrigation will doubtless offer greater possibilities for a large number of new settlers than the coast, where the area of suitable land available for settlement is now very limited. The new settler might find his returns low at first, but by judicious breeding, selection and feeding a herd could be built up which will give a comfortable income.

Dairying seems certain to play a large part in developing the country under discussion, even though larger areas be made available and mixed farming followed.

Return of Infectious Diseases Reported in June.

The following is the return of outbreaks of the more important infectious diseases reported during the month of June, 1925 :—

Anthrax	1
Pleuro-pneumonia contagiosa	1
Piroplasmosis (tick fever)	2
Swine Fever...	Nil.
Blackleg	2

—Max Henry, Chief Veterinary Surgeon.

Aspects of Dairying in the Central West of New South Wales.

E. O. DALGLEISH, H.D.D., Dairy Instructor.*

OF all the districts in New South Wales in which it is possible to carry on dairying successfully, the central west is at the present time—judged purely from the dairying standpoint—the most backward. Excluding the coastal districts, in which dairy-farming is the principal industry, we find that in the Riverina great strides have been made during the past ten years, while in the north there are several large and successful butter factories, such as at Tamworth, Inverell, Glen Innes, and Tenterfield. Yet in the west the industry has been practically at a standstill for many years, despite local conditions, which are at least as favourable, and in some respects more favourable, than those in other inland districts. Anyone interested in dairying travelling in the west cannot fail to wonder why it is that the dairy cow does not find a place on more of the farms, and why in these enormous areas of fertile land even small butter factories find difficulty in existing.

The answer appears to lie in the over-booming of the industry in the days gone by. Factories which had little chance of success were started everywhere and anywhere. Farmers and landowners generally were induced to buy shares, in many cases investing considerable sums. In the natural course of events such factories closed their doors, and the investors lost their money. The farmer, being no different from anyone else, does not like to lose his cash, especially when it seems to have been lost unnecessarily, and thus a feeling of bitterness against the dairy industry was given rise to, and the business of cream production discouraged and looked upon as unprofitable—a view that persists in many places to-day.

The reason for the failure of these old-time factories is not hard to find. Lacking supplies, lacking capital, and often badly managed and equipped, the first drought was enough to put many of them out of action. Coastal factories, in most cases, have the benefit of boards of directors, who have a considerable amount of knowledge of factory operations and dairying generally. In the west this was not so, and everything devolved upon the manager, often with dire results. There was one instance in which a local commission agent was appointed manager of a factory. The butter turned out was so bad that it could not be sold locally, and was sent to Sydney, where good butter was purchased and returned for the factory's local trade. Naturally, under these conditions the return to the farmer could not be other than most disappointing, and such instances might be multiplied many times over.

* Paper read at the N.S.W. Co-operative Dairy Factory Managers and Secretaries' Association's Conference, Sydney, June, 1925.

Then again, these small factories in their local trade had to meet the competition from the coast, where the well equipped and managed factories turned out a better article in large quantities, and hence at a smaller cost. In those days there was no Advisory Committee regulating the price of butter, and the establishment of branches of Sydney selling agencies in the larger towns often intensified the difficulties of the factories. In Professor Hunziker's "Butter Industry" is a description of a condition of affairs in the United States which is in many ways applicable to inland dairying in our own State. He says: "In recent years the creamery industry, and with it the entire dairying industry, has suffered great losses, and has been delayed in its progress by the activities of the creamery promoter." It must be stated, however, that in New South Wales these creamery promoters were not men who reaped a harvest from the flotation of dairy companies, as in America. Rather were they men acting in a mistaken effort to further the industry in their own particular districts, yet the ultimate ill effect was much the same. Continuing, Professor Hunziker says:

"Grim monuments to the activities of the creamery promoter may be found in many parts of the middle west in the form of defunct creameries. Their history, regardless of location, is much the same, and their careers have had a depressing and retarding influence upon the rational development of the dairy industry. They failed because they lacked the fundamental essentials of a successful creamery. While organised under the promising name of co-operative creameries, the incentive leading to their creation was not the co-operative spirit of the respective communities. In most cases the cow population was entirely inadequate to furnish the necessary raw material to make profitable operation possible, the necessary operating capital was lacking, incompetent butter-makers made an inferior product, inexperienced managers mismanaged the business, the frail tie of co-operation between the stockholders was easily rent by unsatisfactory returns from the market, and the inevitable result was disorganisation, dissolution, and failure. In a few isolated cases only have these creameries survived these discouraging handicaps, largely on account of exceptionally favourable local conditions, or of the individual and unselfish effort and ability of some one person strong enough to safely guide the ship through the turbulent waters into which it was launched. In some cases these creameries passed into private hands at great loss to the stockholders. In the great majority of cases, however, the promoters' creameries succumbed, after incurring additional debts, to the natural consequences of the law of the survival of the fittest.

"These defunct creameries . . . have impoverished the communities in which they are located, they have caused their stockholders the loss of thousands of dollars, they have cast distrust and suspicion on the creamery business, and discouraged the business of milking cows and selling cream for butter-making."

This description of the establishment of factories in the middle west of the United States aptly describes also their establishment in the central

west of New South Wales. Hardly a town exists in this area which did not at some time or other have its butter factory. To-day only six survive—at Mudgee, Bathurst, Blayney, Canowindra, Parkes, and Dubbo. At Mudgee we have an example of a factory which has survived only because of exceptionally favourable local conditions, comprised in the greater area of purely dairying country it serves. Bathurst factory has undoubtedly been kept going by the individual effort and ability of its manager. This small factory, opened twenty-three years ago, is the only one in the west which has never for one day closed its doors during that time. Though not situated in a district very suitable to dairying, the Bathurst factory is to-day in a strong position. Few factories pay their suppliers a higher price, their return for May being 1s. 2½d. per lb., plus a bonus of 2½ per cent. to shareholder suppliers. In addition, both the manager and butter-maker hold what is probably a record for the State in length of service, both having been employed for twenty-three years.

Parkes and Canowindra factories are co-operative factories which have passed into private hands, though not necessarily at a loss to the stockholders in either case, and the remaining factories at Dubbo and Blayney have always been privately owned.

It does not need much imagination to picture how in the old days, before the Dairy Industry Act came into force, suppliers' tests were cut down in an endeavour to make the factories pay when financial rocks appeared ahead. Evidently farmers soon found that they could produce more butter by churning it themselves, hence the dairy butter industry throve, and the factories thus produced another problem for themselves.

From the public health point of view the manufacture of dairy butter is not to be commended, and it is pleasing to note that its production is gradually declining, an increasing number of farmers preferring to patronise the factories. That they should not do so is beyond explanation when one remembers that the prices they receive for dairy butter are often 6d. per lb. below the factory price for commercial butter, and that when making up 1 lb. pats the farmer will often give as much as 1¼ lb. in each pat. Thus, saying the factory price for butter is 1s. 4d., the farmer often sells his dairy butter for 10d. to grocers, giving them 1¼ lb. in each pat, and therefore actually realising for it only 8d. per lb. That he should do so can hardly be explained, but these are the facts as they exist, and yet storekeepers almost without exception dislike to handle dairy butter.

That the conditions under which dairy factories in the west operate to-day are vastly more favourable than, say, fifteen years ago need hardly be said. Almost all occupy central positions, and thus can draw their supplies from a large area. For instance, at Dubbo six railway lines and at Parkes five converge on the town, and practically assure supplies of cream. The factories at Blayney, Canowindra, Dubbo, and Parkes are under one control, thereby assuring efficient management. Further, the fullest advantage is now taken of various side-lines, such as ice, rabbits, poultry, &c., whereby running costs are lowered, and operations even rendered possible

should cream supplies cease altogether. Experience has proved that factories cannot exist closer than 50 miles from one another in these districts, and for preference they should be near the large centres of population. The factories operating in the west to-day are sufficient to handle the production for many years to come.

Of the factors which have improved the inland factory's prospects, the pasteuriser has been perhaps the greatest. Only by its use have these factories been able to produce butter which can compete with the coastal product, and experience has proved beyond any doubt that cream can be sent long distances and still be made into good butter. The western farmer usually has to send his cream by train fairly long distances, and, provided the cream is properly handled on the farm, it is astonishing how little effect the train journey appears to have, even in the summer months.

Dairying in the west has to compete with other branches of farming, such as sheep-raising and wheat or lucerne growing, in which the labour done by the farmer is not nearly so constant, and the returns, though more uncertain, may be much greater. This being so, it is necessary for the western dairy-farmer to receive as great a return as possible for his dairy produce to keep him in the business, and it is also necessary that the labour or drudgery of dairying be lessened as far as possible.

Greater returns than on the coast can be assured only by taking full advantage of the opportunities that exist for local sales, and to-day, with one exception, this is what western factories are doing. By selling butter direct from the factory door, expenses of marketing are completely cut out, assuring farmers a greater return. Export may on occasion return more per pound, but local sale assures a quick return, and it is a quick return the farmer wants. Yet, even allowing for all butter being locally sold, western farmers do not produce half what is required. For instance, within 5 miles of the Orange post office there is a population of 16,000 people, who do not consume ten boxes per week of western butter. Lithgow, a town of 17,000 inhabitants, obtains all its butter from Sydney. It will thus be seen that the possibilities before western farmers of the expansion of dairying, and therefore of local sales, are very great.

The western farmer may lessen the labour of dairying by arranging that all his cows come in during one month, for by this procedure he is able to have two or three months' freedom from milking during the year. Many coastal dairymen already do this, but as a rule, in the west, the bull runs with the herd all the year round. The coastal dairyman arranges for his herd to come into work in the spring, but on the central western slopes the period of the year when the growth of green and succulent grasses is greatest is the winter and early spring. This, then, is the time when the farms should be producing most cream, and cows should calve during the late autumn. The winter on the western slopes is mild; cold and sometimes frosty nights alternate with spring-like days, and conditions are ideal, not only for the production of a good article, but at a price which will return to the farmer far more than he receives in the summer months. By

dairying in the winter and spring, the farmer's hands are free when the time for the wheat harvest comes along, and if his crop is a failure he can still make use of it as feed for his cattle. Farmers who combine a little dairying with wheat-growing have told me on many occasions that the cows paid their expenses, leaving the returns from the wheat as clear profit. These men are in a far more fortunate position than many who this past summer found that the greater part of their wheat cheques had to go to the storekeeper who had kept them going during the two previous bad seasons.

On the tablelands, of course, the winter months are too cold to carry on dairying without hand-feeding, and in those parts it must be confined to the summer. As a general rule, milking machines in the west are conspicuous by their absence. By their use the work of milking can be got through quickly and easily, and for this reason they are to be recommended, especially as there are now on the market types of machines that are clean, efficient, and inexpensive to instal.

The foregoing may indicate some of the directions in which the inland farmer is "on a better wicket" than his coastal brother, but there are still others, such as the price of his land. The very best of wheat land in assured districts can be bought for £15 an acre, and even alluvial land along the rivers can in many cases be had for as little as £10 an acre. Many farms on the coast are at an almost prohibitive price for dairying; certainly a smaller area is required, but the difference in area does not compare with the difference in price.

Another advantage is that the inland farmer can with little trouble grow large quantities of fodder, and, what is more important still, store it for long periods without loss. Thanks to the dry climate, expensive tub silos are not needed, the cheaply constructed pit silo meeting all requirements. Often on a farm the material that would otherwise go to waste is sufficient to feed a small herd. Every year vast quantities of good fodder are not availed of. In lucerne-growing districts, such as Canowindra, it is customary for the "first cut" in the spring, containing a growth of grass and weeds, to be raked up and burnt. This hay, which would make excellent feed for stock of any kind, is wasted in thousands of tons every spring. The man who has the lucerne, of course, does not need it, but why other farmers do not make use of it is hard to understand.

I have often been told, usually by someone who "has an axe to grind," that dairying is not a suitable industry for the west, and that it cannot be conducted successfully. In endeavouring to show that this is not the case I will give only one instance of a man who is dairying successfully further west than one would think possible. This is Mr. W. Shepherd, of North Borambil, on the Lachlan River, about 17 miles above Condobolin. This, it may be explained, is on the central western plains, 330 miles from Sydney, and climate and rainfall there are far less favourable than on either the slopes or tablelands. Mr. Shepherd may truly be described as a man who is pioneering the dairy industry in the further west. Although

he has been on his present property for twenty years, it is only during the past three years that he has been dairying, and that in spite of the greatest difficulties. Milking a small herd of fifteen to twenty cows, he now intends to increase his herd and instal machines. His land is typical of hundreds of thousands of acres on the Lachlan, and this farm of about 700 acres indicates of what such land is capable. Nine months ago he planted a patch of 12 acres of lucerne, and already has a large stock of hay from it. A suction gas-engine and 8-inch pump are installed to irrigate the lucerne from a nearby creek, but it is obvious that once the stand becomes established and strikes down to underground moisture, irrigation will rarely be needed. Mr. Shepherd's greatest difficulty has been with the transit of his cream. This he himself has to cart 17 miles to Condobolin, whence it is taken by train to Parkes, a further 62 miles. Arriving at Parkes too late for treatment, it has to wait until the following day, and as a result is often second grade. Few farmers on the coast have to put up with handicaps such as these. Although the dairy is only a side-line, it is to this farmer's credit that he has persevered, and now there are rumours of others following in his footsteps, while the transport problem has been solved satisfactorily.

If one man can do this out in the plain country, where rainfall is uncertain and conditions difficult, it must be evident that in more favoured localities dairying is a good proposition, for the rainfall on the central western slopes and tablelands varies from about 21 inches annually at Dubbo and Parkes to 35 inches at Orange.

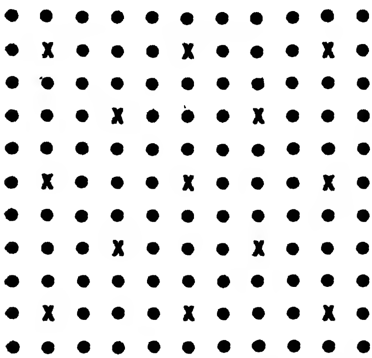
I have endeavoured in the foregoing to give some idea of dairying conditions as they have been in the past and as they are to-day. For the present, there is a slow but certain increase in the number of farmers including this branch of farming in their operations. As to the future, there is little doubt that eventually the local production of dairy produce in the west will overtake the consumption of it, and perhaps leave a considerable proportion for export, as already is the case in the Riverina. To those who see the inland country one thing is plain, and that is that agriculturally the surface of New South Wales has as yet been hardly more than scratched. The systematic conservation of water will work wonders. So also will the subdivision of large estates. Few whose work confines them to the coast realise the vast area of these inland holdings, and as they were the first lands taken up, so also they everywhere comprise the best land available. For instance, a few miles from Mr. Shepherd's farm, which I have just mentioned, is an estate of 100,000 acres—over 150 square miles. Take in imagination 150 square miles in the districts supplying your own factories, and an idea will be gained of the size of such areas. In good seasons the income of such holdings is very great, their purchasing power is enormous, and by offering enticing prices the smaller men are continually being bought out and their land tacked on to the larger places. The large landowner, knowing that the dairy cow must follow closer settlement, often does all he can to disparage dairying, but as population increases closer settlement must follow. Then, and only then, will the inland butter factory

come into its own, and grow perhaps to the size and importance of other factories described by Hunziker in the following manner:—

"In the great stock-raising and grain-growing section of the middle and far west, the creamery organisation has lent itself admirably to the establishment of large centralised creameries, which draw their supply of raw material from a vast area. They are furnishing a ready and profitable market for the product of the general farmer who has only a few cows, and with whom dairying is a side-line rather than the main business. They have opened up and are developing the husbandry of the dairy cow in sections where dairying was formerly thought to be unprofitable, and thereby have become a mighty factor, not only in increased milk and butter production, but in the restocking of the land, improving the fertility of the soil, making farming more profitable, furnishing the means for the better education of the farmers' sons and daughters, and dignifying the profession of agricultural pursuits."

Provision for Pollination in the Orchard.

As pointed out in recent Orchard Notes, pears, apples, plums and certain other fruits require cross-pollinating by others of their kind if they are to set satisfactory crops, and this must be borne in mind at time of planting. The accompanying plan illustrates a simple way of correcting the omission where such provision has not been made, each cross representing a tree to be worked to a suitable variety that blooms at the same time and that has proved to be a satisfactory polleniser for that variety of fruit. It will be seen that by adopting the plan only about nine trees per acre need be re-worked.



It is sometimes laid down that at least each fourth row in an orchard should be composed of a variety which blooms at the same time and which constitutes a suitable polleniser for the rest of the trees. According to our experience, however, the pollenisers should not be the fourth, but the third row, as the most efficient results have been obtained where pollenisers have been planted at a distance of not greater than two rows away. A grower who contemplates planting out largely a comparatively good variety of apple, such as Granny Smith, might follow the plan suggested, introducing a tree here and there as a polleniser, quite satisfactorily.

If the grower intends planting two varieties, such as Granny Smith and Delicious, the former predominating in number, then two or three rows of Granny Smith could be planted to every row of the other variety—for instance, the first row could be Granny Smith, the second Delicious, and the third and fourth Granny Smith, but under no circumstances should Granny Smith be planted more than two rows away from the pollenisers.—W. J. Allen.

The New South Wales Cheese Industry.

Some Lessons from the Past Year's Experience.

T. H. ATKINSON, H.D.A., N.D.D., Senior Dairy Instructor.*

The prosperity of the cheese industry depends upon economy of production and the ultimate return to the milk supplier. That the industry is making progress is proved by the increasing number of cheese factories which are coming into being each year.

In the past cheese manufacturers have, fortunately, been able to dispose of a large proportion of their product on the local market, and this, perhaps, has been the primary reason for their advance, there being little competition and lower marketing costs. With increased production comes the necessity for export and its more exacting requirements as to quality of product. The cheese which sells on the local market is no good for export, neither is its size. Two distinct types are being produced, and it is necessary on this account to make for the market.

The Export Market.

Our export market, comparatively speaking, is in its infancy, but it must grow. At this critical stage consideration should be given by manufacturers as to the advisability of arranging manufacture to permit of uniform quality being sold under one brand, in order to obtain the best possible trade name and price.

Pasteurisation stands for improved quality, uniformity, and a better keeping cheese, to say nothing of the extra yield obtained through smaller loss of fat and the incorporation of a greater quantity of moisture. In this connection, Mr. J. A. Ruddick, Dairy and Cold Storage Commissioner, Canada, in a report after a tour in 1923, said that the great improvement in the quality of New Zealand cheese was due to the pasteurisation process. The cheese-making is simplified and the cheese-maker is in a position to make practically the same flavour and texture day after day. Previous to pasteurisation a "dirty flavour" in New Zealand cheese was not uncommon.

Our experience in New South Wales has been similar, and there is no doubt that pasteurisation of milk for cheese-making is absolutely essential in the interests of the industry in New South Wales.

The Local Market.

The local market has by no means been exhausted, though during the past season much more cheese was manufactured than was absorbed by it.

* Paper read at the N.S.W. Co-operative Dairy Factory Managers and Secretaries' Associations Conference, Sydney, June, 1925.

' See *Agricultural Gazette*, September, 1924, p. 649.

Unfortunately, too much cheese of very inferior quality was passed out for consumption, and this has had a very much greater retarding effect than one would at first imagine. Picture the man who daily lunches on bread rolls and butter (and there are thousands of them); who, feeling he wants more, calls for cheese, and receives a piece which is bitter or has a bad smell, or in appearance is uninviting. He probably eats it, but with every mouthful conceives a deeper prejudice against cheese. Good cheese, on the other hand, has the very opposite effect, the man's palate clamouring for more of the thing that is pleasing. Thus good cheese establishes a habit, which is persisted in till the bad piece comes along again.

The Food Value of Cheese.

Cheese is a food second to none and cheaper than any commodity (or group of them) of similar food value. Its extremely high food value, both as regards protein and total energy, entitles it to a much more important place in the diet than it has commonly been given in this country. Travellers going into places where the food supply is uncertain, and desiring to carry a food providing a large amount of energy with as little bulk as possible, have long recognised its value.

It has been demonstrated that, contrary to the general impression, cheddar cheese is neither indigestible nor constipating: indeed, 95 per cent. of it is digestible and 90 per cent. of its energy is available. The protein value of 1 lb. of cheddar cheese is equivalent to 2 lb. of sirloin roast, 22 eggs, or 3 lb. of fish. To equal the *energy value* of 1 lb. of cheddar cheese, 2 lb. sirloin roast, 26 eggs, or over 6 lb. of fish are necessary.

As a substitute for meat, cheddar cheese holds first rank both in regard to food value and relative cost. Instead of being used solely as an appetiser or condiment, cheese is worthy of and should be given a substantial place in the diet.

No mention has been made of the indispensable dietary constituents known as vitamines. Fat-soluble A and water-soluble B are both present in cheese. Butter-fat contains fat-soluble A in abundance. Vegetable oils do not furnish this vitamine, neither are the body fats of animals, such as lard or beef fat, important sources of it.

The Cost to the Consumer.

The cost to the consumer is a material factor in increasing or decreasing the consumption of cheese, and if the local market could be extended to absorb some of the cheese which would otherwise be exported, there would be a monetary saving plus a reduction of risk and shrinkage on all cheese so absorbed. The disparity between wholesale and retail prices locally need not be discussed except to mention that with increased sales there would be a greater possibility of reducing the selling cost per pound, thus lowering the price to the consumer and assisting in the extension of our best market.

It might be pointed out here that the law of supply and demand governs prices and the quality governs the demand, be it locally or on the world's markets. The demand is unlimited for best quality. Special makes brought 2d. above ordinary cheese during the past season's glut and sold, while some of the inferior cheese was hard to pass on at 2d. below market rates. It may be news to some to know that during this period special imported cheese of several varieties was being retailed in Sydney at from 3s. to 5s. per lb. The above remarks have been made to emphasise the importance of quality, and with it one must always bracket uniformity.

The Cost of Production.

Good cheese costs little more than bad cheese to make in actual expenditure, but note the difference in return to the producer for the little extra first cost in the following examples:—

Example A.—In a period of seven weeks 7 tons of cheese were made and sold at an average price of 4·2d. per lb. The ruling price was 7·25d. The difference between a cheese-maker's wages and the wages of the boy actually employed was 15s. per week, or £5 5s. for the period. The amount lost through bad manufacture was 3·05d. per lb., or £200 over the period. The loss in yield not accounted for was also great.

The loss to this factory through employing an unskilled man, for the sake of £5 5s., was at least £194 15s. in seven weeks.

Example B.—This cheese factory is situated in new country, and there are many real difficulties to face; but the case serves to illustrate what can happen and what is happening perhaps to a less degree in other factories which are much more favourably situated. For a period of five months the factory received an average milk supply of 450 gallons. From many causes the milk was as a rule very fast, with the result that over a period of five months the average price for 70 per cent. of the cheese was 1½d. below market rate, and the yield of this cheese was 5 per cent. lower than the 30 per cent. bringing the market rate. If this 5 per cent. lost cheese had sold for the price of the best lot—it would have actually been made and sold at "top" if the milk had been good—it would have returned another £68 16s. 8d. to the factory. The loss of 1½d. on 70 per cent. was £295 6s. 4d., making a total loss in five months of £364 3s.

The pasteurisation of the milk would have meant the saving of that cost and more to the factory. Unfortunately, it took the price of a pasteuriser to demonstrate its necessity.

These are just two examples of the false economy practised at many of our cheese factories. The lessons to be learned are that the use of well-equipped and well-designed cheese plants, and the employment of skilled labour, reduce the cost of manufacture. The losses that occur represent cash from which no expenses would be deductable.

The need for better-equipped factories and suitable storage accommodation for cheese is very real, and should receive special attention if the manufacturer is to do his bit towards the prosperity of the cheese industry.

Reinfection of Pasteurised Cream.

(1) From Factory Utensils.

A. M. BROWN, Senior Dairy Instructor, and H. H. RANDELL, Assistant Bacteriologist.*

Most defects in the flavour of butter are due to the action of bacteria, either in the cream before its manufacture into butter, or in the butter after manufacture.

Cream, on its arrival at the factory, is teeming with germ life, the types of which are influenced by the general conditions of cleanliness on the farms. If insufficient attention to cleanliness has caused the cream to be largely infected with organisms which cause decomposition of any of its constituents, the products formed by their action will either give this cream an undesirable flavour or aroma, or cause its physical condition to assume a form indicative of undesirable fermentation. These conditions enable the cream grader to identify cream which is unsuitable for pasteurisation in the manufacture of a good quality butter, and also to select an article which has not been adversely affected by the action of germ life, and can be improved and rendered practically germ-free by the process. Thus, by efficient cream grading, the first and most important step is taken in the production of a high-class butter.

Unfortunately, however, there are other factors which combine to nullify the efforts of the cream grader in this direction, and it is one of these, the contamination of cream after it has been pasteurised, that forms the subject of this paper.

If pasteurisation is efficiently carried out, a reduction of over 99.9 per cent. in the bacterial content of cream can be effected, with either the holding or flash systems, but during each of the subsequent stages of manufacture the organisms have been found to increase enormously.

This reinfection may be brought about (*a*) through the pasteuriser itself; (*b*) through the water used in manufacture; (*c*) through the utensils used subsequent to pasteurisation.

Reinfection from the Pasteuriser.

Many instances have come under notice during the past season where leaky coils and joints in the lining of batch machines have been the means of causing considerable reinfection, and, generally speaking, these conditions have occurred through overtaxing the machines during an abnormally heavy season.

* Paper read at the N.S.W. Co-operative Dairy Factory Managers and Secretaries' Association's Conference, Sydney, June, 1925.

It should be realised that, as in the case of all machinery, the term of efficiency of a pasteuriser has its limits and is dependent to a great extent on the amount of work it is called upon to perform and the care it receives. Many of these vats were installed some years ago, when factories first commenced pasteurising. The extra work required of them last season has reduced their efficiency by accentuating many existing weaknesses brought about in the ordinary course of wear and tear by too long and constant use. Leaky joints and coils have been the result.

Again, while cream is being pumped into vats prior to pasteurising a considerable amount of splashing occurs, and much of the raw, strongly acid cream is thrown against the sides and lids of the machine. These splashings become a definite source of reinfection through their dropping back or being washed down into the bulk at some time during the period elapsing between pasteurising and churning. These conditions would account for the large increase in the bacterial content which has been often observed in pasteurised cream after standing for some time. It has also been frequently noted that the action of the acid in these splashings on the metal lining of the batch pasteuriser forms verdigris and other metal compounds, minute quantities of which, if added to cream will cause the development of a tallowy flavour in butter. To prevent trouble occurring in this way, spray down the sides and lids of the machine with a minimum amount of water as soon as the pumping is finished or before holding is commenced.

The reinfection introduced by the use of contaminated water is being dealt with in another paper at this Conference.

Reinfection from Utensils Used Subsequent to Pasteurisation.

On a number of occasions when investigations have been carried out as to the cause of inferior quality butter, churns have been found largely infected with injurious germ life. In two cases the surface of the inside of these utensils was scraped before the cream was allowed to run into them. The substance obtained from these scrapings was mixed with water, and plate cultures of samples representing one gram revealed in one instance a count of 3,000,000 and in another of 20,000,000 organisms, two-thirds of which were of undesirable types.

Numerous plate cultures have also been made of the rinsing water used in churns, samples having been collected when the last of this water was being run out just prior to the commencement of churning. The counts of organisms on these plates ranged from 1,000 to 9,000,000 per c.c., and these almost invariably consisted of such injurious types as *B. fluorescens*, *B. proteus*, *B. zopfii*, species of micrococci, *B. coli*, yeasts and moulds, the action of all or any of which may cause undesirable changes in milk or its products.

There appears to be a great difference in the methods used for cleaning utensils at the different factories throughout this State, and few, if any, of those which have come under notice can be termed effective from a bacteriological point of view. A detailed account of each of them is

unnecessary, but in two instances the general procedure followed might be quoted as examples of their ineffectiveness in this direction. They are as follows:—

Factory No. 1.—*Night*: Churn containing hot water from hose and occasionally about 3 lb. of stone lime allowed to revolve for twenty minutes, then drained, swilled with cold water, and allowed to stand all night. *Morning*: Swilled only with 30 or 40 gallons of cold water.

In this case plate cultures of the rinse water that did not contain lime, showed a count of bacteria of 800,000 per c.c., all of which were objectionable types, and which are all commonly found in connection with putrefactive milky matter.

Factory No. 2.—Churn rinsed with hot water (two or three buckets full from wash-up vat), and then rinsed with cold water.

Plate cultures of the rinse water from the churn washed in this way showed a huge count of 9,000,000 bacteria per c.c., including acid formers and many injurious types.

From these facts it can be easily understood how reinfection can take place from insufficiently cleaned churns.

Some attemperators used in connection with the flash system of pasteurisation have also been found to be a source of contamination where, through some structural fault, rinsings have not been allowed thoroughly to drain away. These vats are sometimes made with flat bottoms, with not sufficient fall to allow thorough draining, and in such cases part of the rinsings collect on them in the form of milky-looking water, which has been found to be teeming with injurious germ life. The ideal attemperator, therefore, is one constructed with a slightly rounded bottom and placed in a position where it can be thoroughly drained.

The flumings and pipes which convey the cream to the churns have on occasions been found to be dented, and (especially in the case of the latter) extremely difficult to keep clean.

An Effective Method of Cleansing.

The knowledge that so many sources of reinfection exist emphasises the necessity for the universal adoption of some effective method of rendering all utensils as free from bacterial contamination as possible; otherwise the benefits of pasteurisation become nullified. Any such method should be one which first of all removes thoroughly all fat and milky material from utensils without causing injury to them, and also effectively destroys living organisms present.

Washing soda is used in many factories for the first mentioned purpose, but its indiscriminate use causes the woodwork to which it is applied to become soft and porous and to have a furry surface which is most difficult to keep clean. Lime, however, has the opposite effect, as it appears to harden and also deodorise the timber, and for this reason its use is preferred to that of soda.

As a means of destroying germ life, boiling water takes first place, and may be regarded as the most important item in any effective system of cleansing. After considering these different factors, the following procedure is recommended in the treatment of churns, &c.:—

Night.—First spray the churns with hot water from a hose to remove the bulk of adhering particles remaining, add 1½ lb. quick lime to 30 or 40 gallons of water in the churn, scrub and revolve a few minutes, drain off, and add 40 to 50 gallons of boiling water; again revolve churn four or five minutes, drain, and allow to stand with door wide open until morning to facilitate drying.

Morning.—Revolve churn containing 40 or 50 gallons of boiling water for 10 to 15 minutes; drain, and cool with the filtered water from the cold water tank.

At night the worker and barrow should be scrubbed with hot lime water and afterwards scalded with boiling water. In the morning they should be scalded with boiling water and rinsed with cold water before being used.

It should here be emphasised that only the purest cold water, which in butter factories is usually that from the cold water tank, should come in contact with churns and other utensils.

Flumings and receptacles for holding butter papers and rammer should also be treated similarly, and all pipes for conveying cream to churns dispensed with, flumings being substituted, as the latter allow the ready application of the scrubbing brush.

It is realised that during an abnormally heavy season, when the factory staff is required to work long hours continuously, the process of cleaning naturally becomes much more irksome than during an ordinary season, but it is to be hoped that both managers and responsible employees will realise to the full the important bearing which reinfection of pasteurised cream has on the quality of butter, and that they will make special efforts to see that this part of the day's work receives the strict attention which its importance demands.

(2) From Impure Water.

O. C. BALLHAUSEN, Assistant Dairy Expert.*

The importance of a supply of pure water for butter factory use has been given considerable prominence during the past season. Many cases of the reinfection of cream and butter which came under notice were directly traceable to the use of impure water, either in the cleaning of utensils with which cream came into contact, or during the manufacture of cream into butter. This infection has in all cases taken place after the process of pasteurisation, and has seriously affected the keeping quality of the butter. The foolishness of subjecting cream, particularly cream

* Paper read at the N.S.W. Co-operative Dairy Factory Managers and Secretaries' Association's Conference, Sydney, June, 1925.

which has been carefully pasteurised, and the butter made from it, to an infection which can be controlled, is at once apparent, as the effect of pasteurisation is partly or wholly destroyed.

The value of pure water for his cows and for the washing of his utensils has for years been impressed upon the dairy farmer, but how much more important is it that the water which must necessarily be used during the process of butter-making, portion of which is permanently locked up in the butter, should be of the highest possible standard. There may be, and often is, some excuse for the dairy farmer having to use inferior water on his farm, but there is none for the dairy company which continues to use inferior water when it is possible with comparatively little effort or expense to provide a supply of superior quality. It is safe to say that the losses incurred by the dairying industry in New South Wales through the use of inferior water during the past season ran into many thousands of pounds.

The chief impurities, indeed almost the only ones that need be seriously considered from the point of view of butter factory use, are those which come from an organic source, either vegetable or animal, the latter being much the more objectionable of the two. Both may be present in solid form or in solution; in the former case the water is distinctly discoloured, the colour varying in accordance with the amount and nature of the contaminating material, while in the latter, notwithstanding the presence of considerable impurity, the water may be perfectly clear and wholesome looking. The absence of colour, therefore, is no sign that water is pure, but neither is its presence a sign of dangerous pollution. The important point to remember is that a clear water need not mean a pure water, but that danger may exist even though the water is sparkling and clear. In other words, the quality of the water cannot be judged by appearance only, as the very clearest water may be heavily charged with forms of germ life that are fatal to butter. It is the false sense of security based on the appearance of the water which has so often been misleading to factory managers and disastrous to butter quality.

A striking instance of this aspect came under notice recently. A certain dairy company in the New England district, which was endeavouring to find a site suitable for a new factory building, submitted several samples of water for examination from a running stream and a large well. These samples were as clear as crystal and appeared most suitable for factory use. The bacteriological examination disclosed a count of from 275,000 to 500,000 organisms per c.c., all very unfavourable to butter manufacture. The sample containing the higher figure was representative of water in a well, thirty feet deep, from which 60,000 gallons were pumped daily. This is very interesting in view of the opinion so often expressed that continuous and heavy pumping tends towards purity of supply, and also emphasises the heavy pollution that may exist in shallow wells. It also stresses the importance of the bacteriological examination of waters in conjunction with other factors relative to butter factory sites.

At this stage some reports of the Biologist of the Department on samples of water submitted for examination may prove interesting. They are typical of many cases of polluted water at butter factories and illustrate most forcibly the value of such examinations. In the case of one factory, the butter wash water, which was a mixture from the river and water from the town supply, showed a total count of 60,000 organisms per c.c. These included such forms as *B. coli*, an organism of pollution, *B. proteus*, a common putrefier, *B. fluorescens*, common in impure water. This sample also carried other objectionable types of organisms, such as yeasts and moulds and certain micrococci, but these were present in fewer numbers. The examination showed that the water was grossly polluted and impure, and therefore was totally unsafe for factory purposes.

In another case the water was drawn from the river at a point no great distance from the factory. It was used for washing butter and for rinsing and washing down adhering cream from cream vats, flumings, cream pipes, etc. The sample for plating was collected from the hose in the pasteurising room. Plate cultures showed a count of 100,000 organisms per c.c. These included large numbers of *B. coli*, *B. proteus*, *B. fluorescens*, *B. subtilis* (common in soil and a putrefier). There were also present certain types of micrococci, yeasts and moulds. The water was grossly polluted and impure, and therefore unsafe for factory use unless filtered or used only with soda for scrubbing purposes.

In his report on another case, the Biologist comments as follows:—"The waters used at the factory carried very large numbers of objectionable organisms. The respective counts were:—Butter wash water, 50,000; town water, 35,000; and river water, 100,000 organisms per c.c. All the samples showed the presence of large numbers of organisms of pollution and of putrefaction. Taking into account the fact that a pure water should contain not more than one hundred organisms per c.c., there seems little doubt of the uncertainty with which these waters are used. Even if the utmost care was taken in the selection of creams and in the manufacture generally, the danger of deterioration of the butter through the multiplication of objectionable organisms picked up from the butter wash water would remain. The water could be effectively treated by pasteurising and filtering. Large quantities could be treated by passing through an injector pipe at 185 to 195 deg. Fah. It would be necessary to filter this water before storing to remove the precipitate caused by heating."

Numerous other extracts of a similar character could be quoted, but these should be sufficient to indicate how serious the matter of water supply is at some factories.

The Sources of Water Supply.

We will deal now with the various sources of water supply and the precautions that should be observed in obtaining and conserving purity. Water for factory use in New South Wales is sometimes obtained from roof water as an additional supply, but usually direct from wells, streams or rivers. Sometimes a municipal supply is used, which may be derived

from any of the last three sources, and very often this supply is subjected to treatment before going into consumption, which renders any extensive filtration or treatment before being used in butter-making unnecessary.

Large storages for the holding of roof water are not common, but some factories in the drier portions of this State have provided very large concrete tanks for this purpose. During the rainy season these are filled and are used only for butter washing and the rinsing of churns and other utensils. Rain as a source of supply is, however, rather unreliable, both in respect of quantity and quality. Falls occur irregularly, particularly in the back country, long dry spells of varying duration alternating with periods of more or less heavy precipitation, and a storage of rain water often fails to provide the quantity of water required during periods of small rainfall except in the cases of small factories.

Rain as it leaves the clouds is free from all foreign ingredients and is thus quite pure, but during its passage through the air it is liable to take up various impurities, organic and inorganic. Included in these impurities are bacterial and fungoid organisms and their spores, dust, smoke, and so forth. Thus rain which falls in the vicinity of larger towns is more liable to contamination than that which falls in the cleaner atmosphere of the country.

Care must be taken in the collecting and storing of rain water. Roofs are usually used as collecting surfaces and the water is conducted by means of roof gutters, spouting, and pipes to the storage tanks. During this process it is liable to be contaminated by dust, vegetable matter, the excrement of birds, etc., washed off the roof. This matter passes with the water into the storage tank and there accumulates and undergoes putrefaction, thus further contaminating the water. It is, however, possible to collect fairly satisfactory rain water by the use of the rain water separator on the pipe leading from the roof to the tank. The principle of the water separator is to prevent the first rain which falls on the roof gaining access to the tank, and to allow subsequent water to run into the tank. The first water washes the roof and is, therefore, very dirty, and is discarded. The subsequent water falling on the roof does not become seriously contaminated, and flows direct to the storage tank. Storage tanks are usually built of brick or concrete below the ground surface, but this adds to the difficulty of cleaning out from time to time. These tanks should always be of heavily reinforced concrete as a safeguard against cracking and the consequent contamination of the contained water when constructed below ground level. The top should be covered and ventilation provided, but at the same time, every care should be taken to prevent frogs and other vermin entering the tank. A small sump should also be provided as an aid to the removal of any matter that may have collected at the bottom of the tank during cleaning operations.

Wells of Various Kinds.

Wells may be of different kinds—shallow or surface wells, and deep wells. Shallow wells are those which are sunk into superficial porous beds of sand or gravel overlying an impermeable stratum, such as clay or rock,

by which the underground water is held up. It is possible to obtain satisfactory water from shallow wells, provided there is no possibility of pollution by soakage from surface washings, and the necessary precautions are observed with regard to position and construction. It is frequently found that not sufficient care is exercised in selecting a site for a shallow well; therefore the water from these wells should always be looked upon with suspicion until careful investigation has proved that there are no possible sources of contamination. The underground water tapped by these walls is comparatively near the surface. Liquid sewage and other matter passing into the soil may easily reach this water in an unpurified state, and without efficient filtration it would be dangerous to use the water for butter-making.

As a rule, the ground water is slowly but steadily moving through the soil towards its natural outlet. This is of importance with regard to the position of the well. Should the well be above any possible source of contamination, that is, in such a position that the ground water flows from the well towards the possible source of contamination, the risk of pollution of the water in the well is generally diminished. The position of the well, however, cannot always be relied upon as safeguarding the water from pollution. If a large amount of water be abstracted from the well at any time, considerable depression of the water level may take place, and thus cause a flow of water towards the well from all directions, including that in which the source of contamination lies. In these circumstances the water in the well would be liable to pollution.

Deep wells are defined as those sunk to considerable depths and which pass through a superficial porous bed and an underlying impermeable stratum to reach water-bearing strata below. The water tapped by deep wells has usually travelled a great distance since it reached the surface of the earth as rain. It is protected from pollution from the soil above by the impermeable stratum. Such water, though it may sometimes be hard, usually forms a safe source of water supply for butter-making, provided magnesia or iron are not present to any extent. Hard water is not desirable for factory steam boilers, because of the scale formed on the inner sides of the tubes and boiler plates.

The lining of all wells must be so constructed as to be quite impervious to soakage from the surface surroundings. Instead of the brickwork being loosely laid around it, which is the common practice, it should be set in cement down to the water level, and as an additional precaution, it is well to interpose a layer of puddled clay all around between the brickwork and the adjoining soil. A more satisfactory plan, where possible, is to substitute monier pipes in place of the bricks, carefully cementing the joints between each length of piping. The piping should protrude above the ground a foot or two to form a coping to prevent surface washings entering the well.

It is not really necessary that a butter factory should be located on a site immediately adjoining the source of water supply. It is of course

desirable to have them reasonably near each other, but it sometimes happens that the most suitable water for factory purposes is not located in the best position with regard to access to roads and the disposal of factory sewage. With the perfection of electric power, it is possible to transmit current considerable distances to operate an electric power pump to force the water to the factory. This gives factories considerably greater scope in the selection of both building sites and water supplies, and in these cases, permission to lay the necessary water pipes and transmission wires is usually not difficult to obtain. This has reference particularly to well supplies.

Water from Rivers and Streams.

Rivers and streams are formed by rain and snow waters after they have passed over and through the land and form the natural drainage channels of the land through which they pass. Therefore, the composition and fitness of such water for butter factory purposes will depend on the nature and condition of the surrounding land, and will vary at different parts of the rivers and streams. Near their sources, where they possibly pass through uninhabited and uncultivated land on hills, they should provide good water for factory use. Later on, as these streams pass through farms, settlements and townships, the waters become polluted with sewage and drainage from the towns and settlements and washings from the farms. Such waters must always be looked upon with suspicion, and in most cases as dangerous for butter factory use without filtration. The polluted waters of rivers and streams undergo a certain amount of purification by natural means as they proceed onwards. This partial purification is brought about by sedimentation, oxidation, the action of sunlight, the action of certain water plants and other agencies. The use of water from rivers or streams for butter factory purposes, unless it has been treated by efficient filtration, is usually not to be recommended. The water is specially dangerous when the river or stream is in flood or when there has been a prolonged drought.

Contamination of Filtered Water.

Contamination of water after filtration, and the consequent reinfection of pasteurised cream and butter may take place in the factory itself. Water storage tanks must have particular care and frequent attention, and this applies equally to both the chilled and service tanks. Even with filtration, in course of time sedimentation takes place, and on this account these tanks must be drained and cleaned out at regular intervals. To facilitate this cleaning they should be fitted with special draw-off plugs. All water that comes in contact with cream and butter should for safety be filtered; this applies to the water used for blending equally with that of the chilled supply. It is useless to filter one and not the other. The wash water tanks should be protected against the entry of dust and vermin, and should be located preferably in an insulated, well lighted, and as nearly as possible dry room. Wash water pipes should also be cared for, and the rubber hosing used at the churns should not be allowed to become soft and

spongy, and should not on any account touch the factory floor when suspended. No pumps and piping, or portions of piping used for the delivery of water for butter-washing or utensil rinsing purposes should ever be used for the delivery of water or partial delivery of water of unknown quality. In other words, the piping used for the delivery of wash water from a sound well should not be extended to convey water also from a creek for boiler feed or the washing of factory premises.

The Purification of Water Supplies.

Water may be purified either by filtration, pasteurisation, or by both combined. Pasteurisation is more expensive than filtration only, but is not always particularly successful when waters are charged with organic matter. Without subsequent filtration in these cases it is not generally desirable, but as an aid to filtration there may be much to commend it. Better filtration of pasteurised water is said to be obtained on account of the throwing together of the sedimentary particles of mineral and organic matters.

Great ignorance prevails regarding the efficiency of filters. The general opinion appears to be that so long as water is passed through anything anyone likes to call a filter it is satisfactory. As a matter of fact, most filters are a danger rather than a safeguard. Although they may remove turbidity from water and make it look clean, many filters are useless as preventives of water-borne infection, and after they have been in use for a time they simply act as culture beds for micro-organisms and so further contaminate the water that passes through them, instead of purifying it. There are several so-called filters on the market for butter factory use, but it is not intended here to enter into a description of them except to say that all of them must have regular and frequent attention. They must be cleaned and sterilised regularly, as germs may gradually work their way into and through the pores of the filtering material. With the exertion of considerable pressure, as by pumping the water through the filtering material, it can be understood how easily pollution may be carried into the water storage tanks. The following comparison of the effects of different standards of care of mechanical filters on the quality of water may be of interest. No data as to the quality of waters prior to filtration is at this stage available, but it is noteworthy that the filters on which the filtering medium was changed frequently gave infinitely better results than those on which the change was made less frequently.

Source of Water Supply.	Filter and Treatment.	Organisms per c.c.
Well ...	Felt filter changed once or twice each day	100
Creek ...	Paper pulp filter changed once a week or fortnight	2,000
Creek ...	Candle filter changed when considered necessary—once per week	3,000
River ...	Sand gravel filter	100
River ...	Felt filter changed occasionally	600
Well ..	Felt filter changed daily	100

The efficiency of the mechanical filters depends wholly on regular and methodical attention. Sand, gravel, charcoal filters, when well-constructed, are extremely reliable, and avoid the necessity of daily attention and the frequent renewal of the filtering medium. They thus to a great extent remove the human element.

Sand holds back suspended particles both mineral and organic, but it is generally agreed that the efficiency of this form of filter is, to some extent, due to biological action within the bed as well as the simple straining process. The growths of harmless minute organisms form a superficial slimy gelatinous deposit on the top of the sand. This not only acts as an efficient strainer, but also attacks and breaks up the organic matter present in the water. Experiments have shown that without the gelatinous substance, the filter simply acts as a strainer, removing the coarse suspended organic and inorganic matter without arresting the bacteria. For this reason a new filter does not work satisfactorily for a week or two or until the slimy deposit has had time to grow. The installation of a filter of this type in a North Coast factory paid for itself in the first few months owing to the improved water supply.

Occasionally, wells supplying butter factories become severely polluted through surface washings obtaining access, and to purify the well presents some difficulties. The following treatment has been recommended:—

One pound of chloride of lime is mixed with 10 gallons of water in a wooden tub, barrel or crock, stirred with a stick and allowed to settle. In the course of a few hours the sediment will have settled, leaving a clear liquid on top. One pound of this liquid will destroy the germ life in 100 gallons of water. In treating wells the strong solution should be added to the well water, and then the well should be pumped out. When the walls of the well require treatment they should be sprayed with the hypo chlorite solution, and the well again pumped out. This treatment has been found very effective.

"The Gardener."

"A book of brief directions for the growing of the common fruits, vegetables and flowers in the garden and about the house." The sub-title gives a good idea of the scope of this book of 260 pages. In short articles of varying length, arranged alphabetically, a few botanical details are given about 275 genera or groups, while the bulk of the space devoted to each class of plant is taken up with suggestions of a practical kind about growing it. Such subjects as annuals, aquatic and bog plants, basket plants, bedding, bulbs, ferns, flower-beds, grasses, hedges, lawns, and so on down to the window gardens, are discussed, and make the work a very handy reference. In certain cases the fact that it is written in view of American conditions has to be borne in mind by the reader, but trouble on that account should be easily avoidable. The author is Mr. L. H. Bailey.

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Some Notes on Tobacco Growing

C. J. TREGENNA, Tobacco Expert.*

FIELD experiments alone can determine whether a locality will produce a suitable type of tobacco. The plant is adaptable to many classes of soils, but its aroma, yield, and habit of growth are affected by climatic conditions very considerably. Generally it will be found that "leaf" useful for commercial purposes cannot be grown within 15 miles of the sea, as the "burn" of the leaf is seriously affected by the chlorides in the soil and atmosphere.

There are many varieties of tobacco, all types of which are highly susceptible to a change in locality. If seed be imported and grown for a number of years, it will be found that ultimately the plants will assume characteristics common to the new locality, and lose their original distinctive features.

The market in Australia is for Virginian leaf suitable for pipe and cigarette tobacco. The other two types are used (1) in the manufacture of the Turkish type of cigarette, and (2) for making cigars. No market exists for the latter two types in this country.

Each country produces a leaf having its own particular burning aroma. American aroma has become the standard for leaf used in the manufacture of Virginian pipe and cigarette tobaccos. The nearest approach to this standard so far found in places outside America is that grown at high altitudes in Rhodesia and Nyassaland. The burning aroma of leaf so far produced anywhere in Australasia is totally different, though in many cases it would not be possible to discriminate on its appearance. Climatic conditions would appear to be the principal reasons for this peculiarity. A similarity will be noted with the tea plant and its product. Indian tea grown in China will at once assume the aroma and flavour of its new habitat, and vice versa. Each tea-growing country produces, like Java, Ceylon, India, and China, its own particular flavour and aroma. The public demand is principally for the type grown in India or Ceylon, because the flavour and aroma, with very slight modifications in blending, has become the standard of most Britishers who are tea drinkers. So with tobacco, we find the public taste is for American flavour and aroma. In Australia the locally-produced leaf is principally used for blending purposes. Hence, the more neutral in the above respects the Australian leaf is, the greater the quantity for which use can be found by the manufacturer. Unfortunately, the Australian smoker is a most difficult person to please. He detects very quickly the slightest deviation from the normal in his tobacco, and manufacturers have therefore to proceed very warily in making any change in their recognised brands.

The largest amount of leaf is generally produced in the northern portion of New South Wales, but in quality, and more particularly in its qualities

* Paper read at a conference of Agricultural Instructors of the Department of Agriculture, Sydney, 30th June, 1925.

of burning aroma, tobacco grown in the southern portion of the State much more closely resembles the American article. This is probably due to the better rainfall and cooler nights during the growing period.

It will be gathered from the foregoing that, unlike most other field crops, we have this difficult and interesting deciding factor of burning aroma always present in connection with the manufacture of this product. In the finished product of crops such as wheat, hay, potatoes, maize, and most other crops there is little difference to all intents and purposes all the world over. The subtleties and discrimination of the olfactories and palate are not of material concern in connection with those products, which are consequently not subjected to the criticism that smokers bestow upon tobacco. The crux of the position is the burning aroma, and all processes lead up to the attainment of a product pleasing in that respect and acceptable to the palate.

The manufacturer of tobacco is prepared to pay up to 3s. per pound for the best leaf in Australia, whereas a manufacturer of flour is only prepared to pay in the neighbourhood of 1d. per pound for wheat, and a little more for maize. The fact is, the skill and science which must be devoted to the production of tobacco is very much greater than that necessary for the production of wheat and similar crops—partly because "production" in the case of tobacco involves a vital and very delicate secondary process. One crop is for the small man tilling a small acreage under constant advice during growth and maturing of the crop; the other is for a man with a large acreage, using machinery to put in his crop, and then doing practically nothing until harvest time, when it is harvested by machinery and sold just as it is taken off the field. With tobacco the harvesting is only a part of the work. Flue-curing is a process which must be carefully watched day and night—and hourly—for six days, and the slightest error in judgment in the regulation of temperature or humidity may result in a most serious loss. After flue-curing a careful watch must be kept on the tobacco when it is placed in bulk and undergoes a further process of maturation.

Climate and the physical characteristics of the soil must be carefully considered, and (as stated before) actual field trials must be carried out before one can determine whether a locality or farm is suited to the production of a marketable tobacco. Interesting differences in growth and quality of the same variety grown in the northern and southern parts of the State were illustrated this season in two samples of leaf from a cross known as Dunbur. This cross was originally made by Mr. H. Wenholz some years ago from two distinct varieties chosen by the writer. Selections were made from the product of the cross, and eventually the fixed type we now call Dunbur was obtained. It may be mentioned that this tobacco has each year topped the market in this State, and has given a better average price than any other variety in all districts of New South Wales, taking yield and quality into consideration. Some growers state that is more susceptible to disease than other varieties, but this is very doubtful.

Heavy rich soils invariably produce rank tobacco, as also do soils with a clay subsoil close to the surface. Standing water very quickly affects tobacco. The best ground is a sandy, friable, deep, well-drained loam, which contains lime and a clay content of not more than 8 per cent. Such a soil is suitable for almost all classes of tobacco. Within reasonable limitations, the more sandy a soil is the better will be the quality of the tobacco. Clay should be avoided in all cases.

Four acres appears to be a safe area for one man to work. He will need a little help during the harvesting period. Given a suitable season, he can expect a return of not under £100 per acre. Experience shows that the most consistently prosperous grower is the small-area man. In large areas labour difficulties arise. Few crops require such assiduous and careful handling—from the time of planting out until the day when the leaf is received in the warehouse—but the good grower is usually well recompensed for his trouble and labour.

There is a fixed market in Australia for flue-cured leaf, but no market for the old type of air-cured leaf. The guaranteed prices of the British Australian Tobacco Company are just about twice as much as the American grower receives for his product, and New South Wales growers are generally well satisfied with the prices paid them.

A Mammoth Apple Products Organisation.

Emphasis is given to the magnitude of American fruit interests by the announcement of a recent merger which brings into existence an apple organisation claimed to be the largest of its kind in the world. The new company will handle the apple from the time it leaves the tree, through various manufacturing processes, and will deliver evaporated apples, apple pomace, cider, apple cider vinegar, and packed fresh apples throughout the eastern United States and in many foreign countries. Every known branch of the industry is to be covered and every bit of the raw material is to be utilised.—*Federal Department of Markets and Migration, Melbourne.*

A New Use for Raisins.

The raisin-growers of America report having discovered a new use for raisins. They are found to be effective as an afternoon bracer to take away "that sleepy feeling." It is reported that a number of large business corporations are now serving a small package to their entire office force as a mid-afternoon bracer. One of the best-known newspaper offices in Canada has arranged for small packages of raisins to be passed among their employees each afternoon, and every employee from the printer's devil to the president takes ten minutes to refresh himself with a handful of appetising and healthful raisins. The practice might well be adopted here. —*Federal Department of Markets and Migration, Melbourne.*

Field Experiments with Rice.

Coonamble Experiment Farm, 1924–25.

L. J. GREEN, Experimentalist.

Rice having proved so successful a crop on the black soil plains during the season 1923-24, it was decided to attempt to produce an area of more commercial value during 1924-25, and with this object a piece of land of about 10 acres was sought that was reasonably level. The general slope of the country is towards the north-west, and this tendency is exhibited to a marked degree on the Coonamble Experiment Farm. The piece ultimately chosen had a maximum slope of 8 inches to the 9-chain length of plot, the slope in portions being as small as 2 inches to the 9 chains. With this comparatively level land it would be possible to obtain ideal rice-growing conditions by the erection of contour levees or banks instead of the parallel check banks used in this trial. The soil was similar to that obtaining generally in the district, with one particularly heavy strip running directly across the centre.

Before being sown with rice this paddock—owing to its rather low-lying position at one end and somewhat poor nature at the other—had not been cropped for some years, but grazed by horses and sheep. It was not possible to give it all the cultivation that could be desired, as it was not until early spring that the most suitable block could be determined. The first ploughing was carried out on 19th September, 1924, with a disc plough, the average depth being 3 inches. Owing to heavy rains during September, no grading or levelling was possible, and it was found necessary to give another shallow ploughing with the disc on 10th October. Immediately after this the plot was levelled, and banks 18 inches high and 1 chain apart were erected with the plough and grader. The irrigation ditch on one end and the waste water drain on the other served to hold the water in these directions.

Sowing.

After the grading and erection of the check banks, the plots were left as if rolled. Sowing was therefore carried out with a combined cultivator drill, set to sow 125 lb. of wheat. This machine sowed 110 lb. of rice per acre. Sowing was very shallow in places, the rice being on the surface. Deep sowing with this method (flooding immediately after sowing) of rice cultivation gives a particularly poor germination, as, although rice has the power to germinate through water, if covered with any depth of soil, the germination is poor. This was particularly noticeable in the heavy black area mentioned, where the soil being very loose the seed was covered in some instances to a depth of 2 inches. A set of harrows, turned upside

down to firm the soil, was attached to the drill. Sowing was commenced on 20th October, and completed the following day. No fertiliser was applied.

Irrigating.

The flooding of the plots was commenced on 27th October, and completed by 2nd November. The area (8 acres) made it impossible to flood more quickly with the limited water supply at hand. Quicker flooding would have been desirable, as it would have given a more even germination. The operation was so regulated, however, as to give each of the three varieties sown over the ten plots as equal treatment in this respect as possible.

Germination was rather slow and irregular. The former can be easily explained, as the weather was cool and frequent showers fell shortly after sowing; as soon as warm weather arrived the growth was much quicker.

Rice Crop at Coonamble Experiment Farm.
Harvesting with Header

The irregularity of germination is less easy to account for. Certainly, on the heavy black soil patches the deep covering of the seed was to an extent responsible; but on the lighter portions excellent early germination was made in some instances, whilst a similar piece of ground not many yards away had a thin stand. The Caloro variety had the most even and regular germination. It has been found in other rice-growing countries, especially America, that a lighter stand always results from immediate flooding of the seed than if the crop is germinated in the moist soil and flooded thirty days later (the method usually adopted in California, America's big rice State). The reason the immediate immersion method was adopted here was to prohibit the weed growth that generally occurs in a rice crop, and in this respect the results were all that could be desired.

On two blocks (Wataribune variety) that were low-lying and had been wet continuously during the previous summer, the germination was very

poor; this was attributed to the caddis fly larvæ, of which there were thousands destroying the seed.

During November a total of 866 points of rain were recorded—the highest monthly total ever registered for the district. This exceptionally heavy rain had a detrimental rather than a beneficial effect on the crop, retarding, as already stated, germination and growth, while the banks, being recently erected and not set, were in many places beaten down. The surrounding bank, however, which had been made particularly wide and substantial, held. Difficulty was experienced at this time in draining off the excess rain water, but by numerous outlets in the bank the water was kept at a fairly regular depth of 2 to 4 inches. During early December the water was raised to its maximum depth over all plots, amounting generally to 7 to 9 inches at the lower end and 2 to 5 inches at the shallow end, but varying on each plot. The Wataribune variety was the best off as regards evenness of watering, as it was sown on the three most nearly level plots, and generally had a depth of 6 inches.

Maturity.

Even and regular growth was maintained by each variety until the middle of January. Colusa, the early variety, began to head out on 19th January, and by 29th had flowered. Caloro, the mid-season variety, and the one that to date had given the best prospects, was five days later than Colusa in heading and flowering. Wataribuné, the latest variety, did not show any heads until 6th February, flowering eight days later. This latter condition extended over a number of days, and was rather uneven in this variety in comparison with Colusa or Caloro.

Colusa and Caloro had ripened enough by 16th March to allow of drying off, and it was on this date that the water was cut off these two plots Wataribune had the water closed off a week later. In the case of the first-mentioned varieties flooding could have ceased a few days earlier, but to make sure of obtaining good plump grain the water was kept on as long as possible. It may be as well to mention in passing that the water, when flooding the plots, was kept slowly moving, and although a fair stream was flowing on to the plots all the time a minimum quantity, varying according to the weather, flowed off, the bulk being lost by transpiration from the plants and by direct evaporation. A comparison of data obtained in America with these varieties and results in this trial may not be out of place.

Variety.		Days taken to head.	Days taken to ripen.	Total Period to maturity (days).
Colusa ...	America	120	34	154
	Australia	95	59	154
Caloro ...	America	128	33	161
	Australia	99	62	161
Wataribune	America	136	40	176
	Australia... ..	111	61	172

From the above it can be seen that the growing period is practically the same in this district as in the big rice-growing areas of California, where

the above data was obtained. The large differences between the Californian and the Australian estimates for the time taken to head is probably due to the differing opinions of the observers, although it seems more rational for a crop to take fifty-nine days to mature after heading than thirty-nine days.

Harvesting.

By 30th March the Colusa and Caloro plots were dry enough to carry the harvester. The previous season's crop had been harvested by cutting with a sickle, but this method was not practicable this season owing to the increased area sown. With the choice between a combined harvester and a header, the latter implement was chosen, primarily because the straw was tough and down in places, and it was considered this machine would deal with it better. The first block of Colusa was attempted with the machine

General View of the 1925 Crop of Rice at Coonamble Experiment Farm.

set as for a crop of wheat, with the addition of a crop-lifter attachment only. It was found that numerous adjustments were required, also that it was impossible to take a full comb, about one-third being the maximum. The loss of grain with the straw was small, the biggest loss occurring at the comb and with the blast over the riddles. Patches of the crop—especially where it was thin and the plants had stooled excessively—were down. In the plots that appeared the best, and actually turned out the heaviest yielders, however, not a plant had lodged. In these places the germination was excellent and the stooling fair.

To get the lodged patches, and owing to the way the heavy rice head turns down, it was necessary to cut about 12 inches or more of straw, and this made the work heavy on the horses. Had the crop been dried off earlier,

or perhaps left a little longer before harvesting, the work would have been easier and better yields might have been obtained. The difficulty with rice crops grown in this State appears to have been connected not so much with production as with harvesting, no machine being available that will carry out this operation except with appreciable loss, although it has been claimed by one manufacturer that should the crop become a commercial proposition they can construct a machine on similar principles to the header to do the work. A conservative estimate of the loss of grain by the absence of suitable harvesting machinery would be 25 per cent. and, without a doubt only two-thirds of the grain was obtained that would have been had the methods of harvesting used in last season's trial been adopted—that is, the crop cut with a sickle and threshed. Owing, however, to the increased area and the desire to demonstrate what yields could be obtained with the cultural and harvesting implements in use by the farmer, this method was neither possible nor desirable.

The actual alterations made to the header were as follows:—

1. Sieve inverted, lips pointing down and to the rear.
2. Teeth of rake at rear of riddle made almost level.
3. Sliding board at rear lowered level with the rake.
4. Two pieces of tin were cut and inserted into the lower halves of the air entrances into the fan. This lessened the draught considerably and prevented some of the loss of grain over the riddles.
5. Lower elevator spindle raised to give more clearance beneath it.
6. Four rows of holes, commencing from the third row of holes from the front of sieve, closed to hold some material there to partly block the draught in that quarter and prevent the material blowing over the rear.
7. Lower sieve sloped towards the front so as to get the grain away more quickly, thus stopping it from passing over the rear and being carried a second time through the drum by the elevators.
8. The speed of the grain elevators was not increased, but its increase would have been advantageous.

It can be seen from the above alterations that the one object in view was to clear the machine as quickly as possible. It must be remembered that a header is constructed to handle a maximum crop of 60 bushels of wheat. When the crop is increased to over 100 bushels, with the additional power required to handle the tough straw of rice, the inability of the machine to harvest the crop with success is not surprising.

Upon completion of the harvesting of the two earlier varieties, the latest variety—Wataribune—was fit to handle, and by 9th April it had been harvested.

The yields obtained from the various plots were as follows:—

Plot.	Variety.	Area.	Yields.	Yields per acre	Yield per acre.	Average yield per acre.
		acres.	lb.	lb.	bushels.	bushels.
1	Colusa	·76	1,813	2,385	54·2	56·7
2	„	·86	2,052	2,386	54·2	
3	„	·81	2,360	2,713	61·7	
4	Caloro .. .	·70	3,061	4,374	99·4	91·9
5	„	·78	3,545	4,545	103·3	
6	„	·78	3,134	4,018	91·3	
7	„	·73	2,366	3,241	73·7	
8	Wataribune ..	·68	2,357	3,468	78·8	61·2
9	„	·86	2,122	2,467	56·1	
10	„ ..	·98	2,099	2,142	48·7	

Notes on the characteristics of each variety and remarks regarding marketing and prospects of rice-growing appeared in the report of last season's trials (*Agricultural Gazette*, August, 1924, p. 555). Suffice to say that this crop has shown its adaptibility to this country, and should be encouraged, for undoubtedly where sufficient water is available it is a crop well worthy of inclusion in the farm course, being sown and handled during slack times of the year with the ordinary farm machinery.

Bore water did not have any ill effect on the crops, as was feared by many. The hardiness of rice will be appreciated when it is remembered that the preparation of the soil for this particular crop was negligible. A gentleman who had seen some of the rice areas of Asia characterised the crop as equal to the best of these. The height of the crop was over 4 feet; in some places 4 feet 9 inches, whereas the average height of these varieties in their country of origin (U.S.A.) is only 3 feet 6 inches. Other important features were the absolute freedom from disease and the absence of weed growth.

Messrs. Robert Harper & Co., Ltd., to whom the parcel was sold, reported on it as follows:—"We are glad to say that the paddy produced a satisfactory sample of edible rice, and that we are arranging to pay for the paddy at the rate of £10 10s. per ton of 2,240 lb. gross weight, delivered on rail, Sydney."

As stated in last season's report, there would appear to be a future for rice in New South Wales, especially with such an extensive home market available. The present market price for rice is fairly regular—£23 10s. per ton for imported unpolished in 56-lb. bags. This, with a 100-bushel crop, is equal to £36 18s. 6d. per acre, although the extra cost of hulling has to be borne by the grower.

Ratoon Rice.

The plot of 1923-24 rice was flooded on 4th September, 1924, in anticipation of producing a ratoon crop, and perhaps of germinating seed fallen from the previous season's crop. During the winter this plot had been grazed by sheep, and when flooded was free of weed growth. The plants

made rapid growth, but weeds made their appearance also, especially cat-tail (*Typha latifolia*), barnyard grass (*Panicum crus galli*), and many members of the sedge (*Cyperus*) family. The varieties Caloro and Colusa were practically overwhelmed with weeds. Wataribune, however, made a thick growth, and this militated to an extent against weed growth, although cat-tail was in this plot.

From the results obtained at Coonamble this season, it is very apparent that the growing of ratoon rice is a practice to be condemned. Two years ago this plot was free of weeds. Now it is nothing but weeds, containing all the worst weeds of cultivation to be found on the farm. This trial was harvested on 6th March with the reaper and binder, and subsequently threshed with a power-driven harvester. This method may be recommended in preference to the use of a header for effectiveness, although it is much slower. The yields obtained were as follows:—Wataribune, 50 bushels per acre; Caloro, 16 bushels; Colusa, 26 bushels.

Growth of the United States Canning Industry.

The tremendous growth in the canning industry of the United States in recent years is evident from the fact that between 1909 and 1923 the output of canned vegetables increased 120 per cent., and of canned fruit 268 per cent. This increase is the more striking when compared with a growth in population during that period amounting to but 22 per cent.—*Federal Department of Markets and Migration, Melbourne.*

"The Culture of Lucerne."

A book on the "The King of Fodders," written particularly for Australian conditions, and gathering up the large amount of experience that has been gained in this part of the world is assured of a good reception. Shorter accounts of the crop there are several, chiefly in the literature of the New South Wales Department of Agriculture and in that of other States, but interest attaches to the appearance of an attractive-looking little book of 265 pages, written by Mr. W. S. Hill, a New Zealander, who has gathered material from all sorts of sources, and has presented a very comprehensive statement.

Discussing the soil conditions favourable to the crop, Mr. Hill remarks that "it has shown itself in New South Wales, as in the United States of America, capable of adapting itself to a variety of soils and climates, provided its peculiar sensibilities are studied carefully, and it is now spreading over a much wider area of the State." The wide range of usefulness of the crop is illustrated by the fact that it is grown over large areas in Queensland and Victoria. The book can be commended to both farmers and students as covering many aspects of the subject, from whom comes our copy.

Published by Whitcombe and Tombs Ltd., Christchurch.

Pasture Improvement on the South Coast and Southern Tableland.

R. N. MAKIN, Senior Agricultural Instructor.*

DAIRY farming is conducted throughout the South Coast of New South Wales, while the Southern Tableland is given up to wool-growing and the raising of fat stock. Pasture improvement is, therefore, a subject of keen interest, and it is proposed to deal briefly with the subject here and to make some suggestions for improving pastures on large holdings.

That pastures need improving in these districts is beyond all doubt. Of recent years, as a result of overstocking, depredations of rabbits, and drought, many of the better class grasses have practically disappeared, and on the coastal areas, owing to soil exhaustion by cropping without fertilising, lands noted for their plant growth show sad deterioration.

Under such conditions good grasses are soon eaten out, and not being re-seeded, the pastures quickly thicken up with coarser and less useful types, such as Parramatta grass on the coast and spear and tussocky grasses on the tableland. As this applies generally throughout these districts, much work is ahead in getting at satisfactory methods of improvement.

In summing up the lessons learnt from the work already done, the following suggestions and methods of carrying them out on practical lines are offered:—

1. Grasses and clovers should be introduced that are suited to the needs and the climates.
2. Fertilisers should be used.
3. Weed control should be practised.
4. Methods of sowing seed and fertiliser should be adopted.

In introducing varieties of grasses and clovers, a careful study of suitable kinds should be made. It may safely be said that grasses affording good pasture during the months of June, July, August, and September would be welcome in both districts. The grazier often casts an anxious eye around during these months for good pasture for lambing ewes, whilst the dairy farmer frequently finds the price of milk higher than any other time in the year. Fortunately we have some good varieties which, when established and not overstocked, provide excellent pasture during these months.

Referring to the deterioration of pastures, it is interesting to note the conditions on the South Coast and the Illawarra. Perennial rye grass fails to hold in pasture more than a year or so; rust makes its appearance, generally during the first year, and, unless weather conditions are distinctly favourable, the growth soon becomes scanty. As regards clover, it is seldom that one notices the wealth of growth so desired by the dairy farmer. Paspalum

* Extracts from a paper read at a conference of Agricultural Instructors of the Department of Agriculture, Sydney, 30th June, 1925.

has gained a strong hold on many farms, and in some parts is not favourably regarded. When one realises the difficulty of getting rid of this grass from pastures, it is questionable whether it would not be better to turn attention to improving the conditions under which it is growing, as it undoubtedly affords excellent pasture for milk production, chiefly in the summer, and is one of the best dry weather varieties that has been introduced. As clover of different varieties grows so well with it, there is little trouble in improving the pasture by sowing seed of suitable varieties during the autumn.

In selecting varieties of grasses for permanent pasture the matter of palatability should be considered. It has been noticed that some few varieties are apparently not so palatable in their early stages of growth, as for instance, cocksfoot. Indeed, it has been noted in some districts that this grass, when sown in mixtures, was the last to be eaten out by stock. Under such conditions it gets a better chance to seed, and eventually the pasture becomes practically nothing else but cocksfoot.

The addition of clover to pasture is imperative. Clover in a pasture is as meat is to the sandwich. Fortunately there are varieties of clover to meet the needs of all classes of soil and all climates. White clover is found almost everywhere, and luxuriating on the better class soils, Red clover finds heavy, sticky, low-lying soils in cool situations most favourable; at the same time it does well on good class soils where the moisture content is sufficient. Subterranean clover, which is comparatively new to the district, is making good, and bids fair to be largely grown on all classes of soil and situations. It will, however, be found useful on the higher levels where other varieties do not hold so well.

The Value of Top-dressing.

Much interest has been centred lately in the use of superphosphates as a top-dressing for pastures. The practice has been to induce farmers and graziers to top-dress a paddock, leaving a strip untreated the entire length of the paddock. This has always produced striking results, the most noticeable feature being the way in which clover growth is induced.

An interesting circumstance in regard to coarser and less nutritious grasses such as Parramatta grass, has been noticed on top-dressed pastures. They appear to become more palatable, and, if closely grazed, may fail to seed and consequently diminish in the pasture. Another feature regarding the top-dressing of pastures will no doubt be the benefit derived from applications on areas where bone-chewing occurs among stock. Very little has as yet been done in this respect, but there is reason to believe that the trouble may largely be overcome by the application of suitable fertilisers.

Weed eradication has become a problem, and should receive immediate consideration. Organised effort to deal with the destruction of noxious weeds, assisted by legislation, is really the best method of attack.

The ideal pasture is perhaps one in which abounds a mixture of varieties of grasses, which, under careful stocking, may be depended upon at any time during the year, providing there is sufficient soil moisture to keep them

going. To obtain this condition, we would rely on our native grasses chiefly for summer pasture, whilst introduced varieties may be found giving satisfaction in the cooler weather. There appears to be a rooted idea (general on the South Coast) that in order to establish exotic grasses (rye grass in particular) it is necessary to plough and harrow the ground prior to sowing. This, to my mind, is a mistake resulting in much loss—loss in the first place of the natural grasses, and loss in the next through having to wait for the young plants to thicken up. Slowness in development owing to the loose nature of the seed-bed, and perhaps several other reasons, might be mentioned against this practice.

To establish a pasture, as desired, the broadcasting of the seed over the area to be treated, and working it in lightly with harrow or cultivator has given really striking results, especially on areas on the Southern Tableland. By this means the native grasses are not disturbed, whilst the transformation to a useful winter pasture assures a greater carrying capacity.

Seeds of many of our useful grasses are small and require but a light covering. The same applies to clover seed. On unploughed soil the rye grasses appear to take a quicker hold and make more rapid growth altogether, and do not suffer so much from the tramping of stock as when grown on land that has been worked up. Where large areas are to be sown there is only one method of use, and that must be a practical one. The one outlined here has been under test, and has proved satisfactory. To Australia, or any country where stock-raising is carried out, the pastures are of the greatest importance.

Peach Leaf Curl.

Last season leaf curl did a considerable amount of damage, and growers who have not yet sprayed would be well advised to see that trees receive an application of lime-sulphur or Bordeaux mixture as soon as possible. These sprays have proved efficacious in keeping the disease in check. Many growers take unnecessary risks in failing to spray, trusting to chance that leaf curl will not make its appearance, but the results are often disastrous. Such risks should not be taken. Keen supervision over the mixing and application of sprays is absolutely necessary, and growers must remember that spraying for fungous diseases is a preventive measure which no prudent orchardist can afford to neglect.—W. J. Allen and H. Broadfoot.

The Value of Classing Wool.

The farmer who takes a live interest in the proper classing of his wool will find that not only will he get full price for his wool, but he will acquire information that will be valuable to him for years to come. His returns will show him the exact value of each class of wool, and will enable him to contrast the values of the different crossbred strains one with another. With that knowledge in his possession it will not be long before he will be calculating which strain it pays him best to breed for, and his crossbred flock will become more interesting and profitable to him than ever.—From Departmental Leaflet, "Classing Farmers' Wool Clips."

The Renovation of Unprofitable Citrus Orchards.

W. H. BROWN, Editor of Publications.

THE renovation and restoration of the neglected and otherwise unproductive orchards which may be found in many parts of the county of Cumberland—of the whole State, in fact—is one of the problems of fruit production in New South Wales. Happily, the total number is not perhaps very large, but when the amount of knowledge, labour, and capital involved in the establishment of an orchard is taken into account, the recovery of these monuments of disappointed endeavour acquires some importance.

Not all these unprofitable ventures come within the view of the casual passer-by, for many are hidden behind belts of native timber. Nor are all of them so far gone that they advertise their poor returns, though their owners would welcome suggestions that would improve matters, but the fact remains that there are a good many beds of trees which could be restored to fertility and productiveness without any great outlay. Often such restoration is possible by more intelligent use of manures and by more consistent use of cultivating implements, but practically in every case it is a combination of better methods that is required. The idea that an airy wave of a magic wand, or the adoption of some simple corrective, is the solution of all the grower's troubles, is not confined to orchardists, but there is no sphere in which it is more contrary to the facts. Better days for many an orchard await improved methods, not in one, but in several respects.

Five Years Ago and Now.

A case in point was brought under the attention of several officers of the Department quite lately by Mr. A. T. Hunter, Orchard Inspector at Castle Hill, when he piloted them round the orchard of Mr. F. Findley at Glenorie. This orchard consists of several blocks of citrus and deciduous trees, but special interest attached to a block of about 5 acres of citrus located on grey sandy loam overlying principally ironstone and sandstone, with patches of a stiff clay subsoil—conditions that are typical of the Hawkesbury sandstone formation. This block, comprising Washington navels, Valencias, and lemons, was planted about fifteen years ago, but about five years ago the trees had fallen into such an unhealthy condition—unthrifty in growth, yellow in colour, and poor in crop—that the owner reflected whether they were worth renovating, being quite disheartened.

To-day this block of trees has been completely recovered. At the beginning of June in this year the trees had filled out till the navels were 11 to 12 feet in diameter and nearly as high, their colour was a healthy dark

green, and they were carrying about 6 bushels per tree of well-shaped, fair-sized, clean, uniform fruit, worth, say, 8s. per case. The Valencias and lemons were in correspondingly improved condition in all respects.

Why the Change?

What has brought about such a change is a matter of interest to owners of other unprofitable orchards in the vicinity of Sydney. There is nothing exclusive about the methods adopted, and there is no reason why a good many other growers should not adopt them with equally satisfactory results.

The primary principle upon which Mr. Findley acted when he commenced remedial measures five years ago was to improve his method of feeding the trees. Many an orchard in this State is unprofitable for no other reason than lack of plenty of plant-food. On the light soils of the county of Cumberland this is particularly important, and even where a certain amount of manure or fertiliser is regularly applied it is often insufficient.

"The majority of orchards are underfed rather than overfed," said Mr. Hunter. "There are few fruitgrowers who do not believe in manuring, but there are not many who feed their trees with all the necessary manures." In all probability this was the case with the orchard under notice. It had been well supplied with superphosphate, for the trees were not neglected, but a "complete ration," to use a live-stock phrase, was what was required.

At this stage the grower appealed to Mr. Hunter with the question whether it was possible to renovate the trees by the use of farmyard or stable manure, and if it would pay to do so. Being advised in the affirmative, Mr. Findley proceeded to look round for material that would build up the trees. A couple of truck loads of manure were first procured from the city and were railed to Pennant Hills. Haulage at that time was a serious matter, for only a couple of horses and a lorry were available, but the manure was carted 13 miles to the orchard. Inquiries were also made as to other suitable fertilising material, and sheep and cattle droppings and animal remainders were next procured from meat works at Sandown. This had to be hauled by road from Parramatta, and as the trees began to manifest improvement, a motor lorry capable of a load of 20 to 25 cwt. was procured. Later a larger lorry with a capacity of 30 cwt. per load was purchased, and the carting in of the animal refuse from every possible source was continued. Nowadays the practice is to take a load of fruit to the city and to back load with manure. Such material should be ploughed in immediately after it is spread round the trees if the maximum benefit is to be derived from it, but with a heavy cartage programme it was not always practicable to plough at once, and rain and other forces sometimes lent their aid in the incorporation of the refuse with the soil.

One effect of dressings like these is to attract the roots of the trees to the surface, which in sour soils is not a disadvantage. As a matter of fact, trees suffer a good deal on sour country from making their root systems

too deep, and under such conditions their health and fruitfulness are both served by any method that will keep their roots near the surface in soil somewhat sweeter than what lies below.

Coincident with the manuring programme, Mr. Findley kept up the cultivation of the soil and—also most important—underdrained the land. As stated above, fertility is not secured by attention to one thing. The moisture content of the soil is conserved, and the preparation of increased quantities of plant-food is encouraged and facilitated by regular cultivation—facts of which these trees to-day afford practical evidence. Surface working has been continued right under the trees, and there is not a yard of soil to-day that is not in excellent physical condition.

Adjoining this block, with which a few years ago the owner was so disheartened, may be seen to-day a small bed of young mandarins—ample proof that the owner has proved the possibilities of the place, and is prepared to extend operations rather than to contract them.

Poultry as Renovators.

Not far away from Mr. Findley's property is an example of quite another means of renovating and restoring a citrus orchard. Eight or nine years ago a block of 300 or 400 citrus trees was in such a bad way that the owner, Mr. Charles Cranston, contemplated grubbing them out. They had had the same attention as the rest of a fair-sized orchard, but these trees were considered past redemption, and of no value. The soil was somewhat similar to that on Mr. Findley's orchard, being of poor Hawkesbury sandstone formation.

It was just at that stage that one of Mr. Cranston's sons became interested in poultry, and as the land occupied by these citrus trees was otherwise suitable for fowls and the trees would perhaps afford some shelter, the block was fenced in with wire-netting and turned over to egg production.

The upshot, so far as the trees were concerned, was wholly unexpected. Within a couple of years they exhibited a marked improvement in appearance and began to crop quite well. During the last three years these trees have borne the heaviest crops of oranges in the whole orchard, and at the beginning of June this year they were carrying a somewhat light main crop, following a heavy second crop last season.

The association of the poultry with the citrus trees was such a success in the first block that the practice has been extended to other portions of the orchard, until 15 acres of trees divided into several large blocks are producing both eggs and fruit. In all, 1,500 fowls are run on these particular blocks, and Mr. Cranston states that his account sales for the poultry have shown gross returns of about £100 per month, against which has to be set an outlay of £10 to £12 per week for feed.

Such returns would not be expected under stone fruit, for the birds, in addition to knocking much fruit off the trees, are tempted to eat the peaches, apricots or plums themselves, and their egg production suffers in consequence, but as fowls do not care for citrus fruit they thrive under the conditions described. Well-constructed houses have been erected for

the birds, but they prefer the trees as night quarters, and constant exercise under such ample range conditions keeps them in excellent health. Doubtless 1,500 fowls on 15 acres of quite good land would not be profitable under other conditions, but in this case their value can only be properly assessed in combination with the crops of fruit.

In vigour and productiveness, the trees have thus been restored at a minimum outlay, and notwithstanding that cultivation is only occasionally practised, Mr. Cranston has not observed that the trees suffer much by dry weather. The continual scratching, encouraged by the dicky rice which collect round the butts of the trees, may partly explain this apparent contradiction of the theories of cultivation.

The trees in the orchard vary from thirty-seven years old down to quite young stock, but it is chiefly among the older blocks that the poultry are run, there being beds of trees properly manured and cultivated to which the birds are not allowed access.

The suggestion naturally presents itself that, quite apart from the blocks to which the fowls are not admitted, it might be profitable to subdivide the large yards still further and to run the fowls in them in turn, spelling each from time to time, but the arithmetic that appeals to Mr. Cranston is that several acres of trees, which at one time had become worthless, and which he proposed to grub out, have been recovered and made profitable by agents which themselves have also returned very appreciable profits.

The practice of running fowls under citrus trees is not novel, and around Kenthurst there are a good many farms where it is to be found in operation with apparently satisfactory results, but the idea of restoring an unprofitable orchard by the means described above is somewhat different. Its success in Mr. Cranston's case is indubitable, and other growers with somewhat similar soil and other conditions might well review it in the light of their own position.

To other citrus growers who also run a few hundred fowls the value of collecting the fowl manure and lightly working it into the soil from time to time, may be suggested.

Classing for Small Flocks.

If only a few hundred sheep have to be dealt with, little can be done in the way of classing. Distinction may be made between coarser and finer fleeces, but beyond that there will not be sufficient scope for the work to be carried out on a very exact scale. For such small flocks the classes may be defined thus:—

First combing—consisting of the coarser, longer staples and brighter class of fleece.

"A" comb—consisting of the finer and heavier conditioned fleeces.

Care should be exercised that wool of the first-combing class is as uniform as possible in length.

The owner should also take special care to see that the fleeces are properly skirted, so that the fleeces may be as uniform as the size of the clip will permit.—From Departmental Leaflet, "Classing Farmers' Wool Clips."

Adventitious Roots in Potato and Tomato.

W. A. BIRMINGHAM, Assistant Biologist.

Two unusual examples of adventitious root development in potato and tomato have been met with in New South Wales within the past two or three years.

Fig. 1 shows adventitious roots* in a potato tuber, the tissues in which they were embedded having been teased away to allow the roots to hang free. Fig. 2 shows similar roots ramifying through the tuber. It will be noticed that anastomosis, or fusion of the roots, has taken place in both cases.

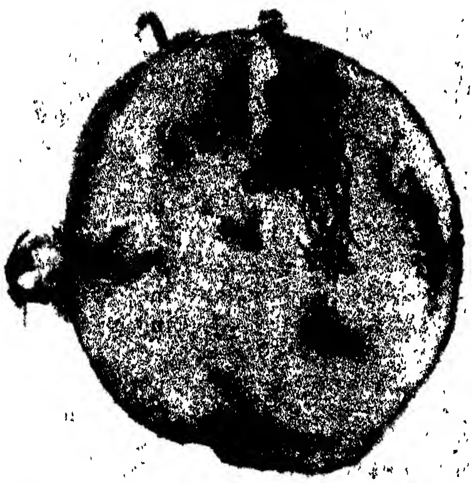


Fig. 1.—Adventitious Roots in Interior of Potato Tuber.

Fig. 2.—Adventitious Roots in tissue of Potato Tuber.

The tomato fruit (Fig. 3) shows both external and internal adventitious roots, the former small, and not easily discerned, while the latter are conspicuous, strongly developed, and ramify beneath the skin throughout the fruit. The external roots are present in the centre of the right hand lower segment, at the stem-end of the middle lower segment, on the edge of the left hand segment of the upper half, and in the centre of the right hand segment of the upper half. The specimen was produced on a typical "rosetted" plant. (See Fig. 4).

Adventitious stems and leaves are comparatively rare, but adventitious roots are common in some plants. An instance of this may commonly be seen in the case of many fig trees in our parks. Roots, instead of being developed from their normal position (the primary root), are frequently produced on stems and branches.

* Roots out of their proper or usual place.

Mutilation of a plant may induce adventitious formations, and when certain parts of a plant become functionless, new formations may arise from points from which otherwise they would not have developed. Strasburger states: "In the development of new formations on a mutilated plant, those very organs arise, of which the plant has been deprived."

Begonia plants can be propagated by means of the leaf or a portion of the leaf.

The three essential organs—shoot, root, and leaf—of plants have a definite mutual relation and origin which are maintained in ordinary circumstances, but in some cases specific changes in the environment and in the constitution of the individual have produced adventitious organs. It is possible that

Fig. 3.—Tomato showing Adventitious Roots.
This fruit was from the plant illustrated in Fig. 4.

Fig. 4.—"Rosette" of Tomato.
This plant came from Orton Park, near Bathurst, but the condition is not uncommon.

in some cases adventitious organs are produced as the result of some special stimulus, such as excessive moisture or nutriment. The two examples cited are not of economic importance, but are placed on record here as being of scientific interest. These notes may also profit many of our growers who are keen observers and always seeking information relative to any unusual types of growth.

REFERENCES.

STRASBURGER'S Text-book of Botany.

WORSDELL, W. C.—"The Principles of Plant Teratology," Vols. I and II, 1915.

To Keep Bees from the Honey Room.

Nothing is more of a nuisance to the apiarist than the presence of bees in the honey room, and it is for the mitigation of this nuisance that the wired window bee escape illustrated has been designed. The window has been photographed as it appears looking inward to the room. Each pane consists, it will be seen, of overlapping sheets of wire gauze, separated from each other by the thickness of two wooden cleats, placed V-wise, but with just sufficient room at the apex of the V to allow a bee to pass out. For a bee to get out through the window is easy; they are always drawn toward a window on account of the attraction of light, and it is natural for them

A Wire Window for Honey Room with Bee Escape.

when on the window to go upward, and in this upward movement they are guided by the guide cleats to the small escapement opening. It might be said since bees are inclined to make upward, why the necessity of the guide cleats and the small opening? Well, we have tried the full opening, but have found that under certain conditions bees endeavouring to get into the honey room find their way on to the edge of the window and follow it down. With the guide cleats they are blocked from doing this. The window offers a maximum scope for egress, and an absolute minimum for entrance, and it has proved eminently effective at the Government Apiary at Wauchope.—W. A. Goodacre, Senior Apiary Instructor.

Pure Seed.

Growers Recommended by the Department.

The Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops, in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon, and (2) after a sample of the seed has been received by the Under Secretary and Director, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the prices for the seeds mentioned hereunder.

Maize:—	
Fitzroy	R. W. Hindmarsh, "Wiaraga," Bellingen.
	Manager, Experiment Farm, Grafton.
Ulmarra Whitecap	R. W. Hindmarsh, "Wiaraga," Bellingen.
Leaming	Manager, Experiment Farm, Grafton.
Wellingrove	Manager, Experiment Farm, Glen Innes.
Sweet Sorghums:—	
Collier	Manager, Experiment Farm, Grafton.
Early Amber Cane	Manager, Experiment Farm, Bathurst.
Gooseneck	Manager, Experiment Farm, Lismore.
Honey	Under-Secretary, Dept. of Agriculture, Sydney.
Saccaline	Manager, Experiment Farm, Lismore.
Selection, No. 34	Manager, Experiment Farm, Yanco.
Selection, No. 61	Manager, Experiment Farm, Grafton.
Grain Sorghums:—	
Milo	Manager, Experiment Farm, Cowra.
Feterita	Manager, Experiment Farm, Coonamble.
Manchu Kaoliang	Manager, Experimental Farm, Bathurst.
Dual-purpose Sorghum:—	
Darso	Manager, Experiment Farm, Glen Innes.
Potatoes:—	
Carman No. 1	Moreton McDonald, Crookwell.
Coronation	E. M. Herring, "Sheen," Batlow.
Early Manhattan	K. Bowen, Springside, via Orange.
Factor	K. Bowen, Springside, via Orange.
Surprise	Moreton McDonald, Crookwell.
Grasses:—	
Phalaris bulbosa	Col. H. F. White, "Baldblair," Guyra.
	Manager, Experiment Farm, Glen Innes.
Hooker's Fescue	Manager, Experiment Farm, Glen Innes.
Tall Oat	Manager, Experiment Farm, Glen Innes.
Sudan Grass—	
Sudan Grass	Manager, Experiment Farm, Cowra.
	Manager, Experiment Farm, Temora.
	Manager, Experiment Farm, Nyngan.
	H. K. Nock, Nelungaloo.
	R. Wilson, North Logan, Billimari.

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

Poultry Notes.

AUGUST.

JAMES HADLINGTON, Poultry Expert.

THE information given in last month's notes on brooding has given rise to a number of questions relating to the maintenance and control of temperatures, particularly with regard to the working of hot water circulating plants and the stoking of the coke-burning type of heaters generally. In order to meet at least some of the difficulties with which the novice at stoking has to contend, the following hints are offered.

In order to commence at the beginning, we will presume that a hot water circulating plant on the system designed by the writer, and here illustrated, has been installed, and that the poultry-farmer has had no previous experience in operating such a plant. Everything has been put in exactly to plan (which is most important), and the operator is about to commence stoking the boiler. It should be first ensured that the damper is pulled out sufficiently far to create a good draught at the chimney (usually 1½ to 2 inches). Then adjust the sliding draught plate situated at the base of the boiler and below the fire bars.

The second plate in front of the fire immediately above the draught plate should be kept tight up to the mouth of the fire-box; no draught should be allowed entrance here. This plate is only to be used when cleaning the fire bars, the idea being that the air admitted to the fire should pass through it via the draught plate and through the grating bars under the fire.

The manipulation and proper adjustment of the draught plate is of equal importance with that of the damper, because, as already indicated, the air must pass through the fire to the chimney pipe. The proper co-ordination of the two is essential to the efficient working of the heater, and also in respect of economy in the amount of coke burnt. Having fixed the draught plate in position, the next thing is its adjustment. Usually ¾ to 1 inch is sufficient opening. This means sliding the plate back to give that aperture. Here again the other portion of the plate must be kept tight up to the mouth of the ash box, otherwise air will be admitted all round it, and the regulation mentioned will be of no avail, with the result that the fire will burn too fast, coke will be consumed unnecessarily, and if it happened at night the fire would in all probability burn out before morning.

Having made these adjustments, and seen that the boiler has been filled with water and a reserve left in the supply tank, a fire should be lighted in the ordinary way with kindling wood sufficient to start a small amount of coke. Do not fill up the heater with coke all at once; get the fire burning well first, say up to half full. If the fire is burning too slowly it may be necessary to give a little more "pull" by slightly opening the damper,

and perhaps also to increase the inlet at the draught plate to get the fire well under weigh, but it is not advisable to allow the fire to burn too fiercely, or the water will be converted into steam before the circulation is completed, in which case the water will be either thrown back into the supply tank or on the roof through the exhaust pipe.

If everything as mentioned above has been properly manipulated, the water should have completed the circuit through the brooders back to the heater well inside of two hours. This should be followed by just that nicety of co-ordination between damper and draught plate as to ensure the desired fire. Such regulation may be a little more or less, according to weather conditions. In some situations there will be more "pull" on the chimney than in others. For instance, if a sufficiently high temperature is not being

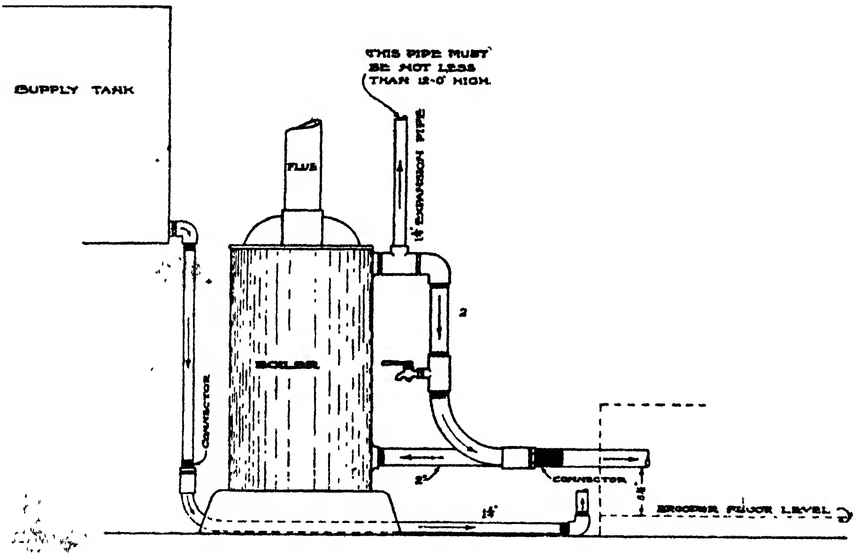


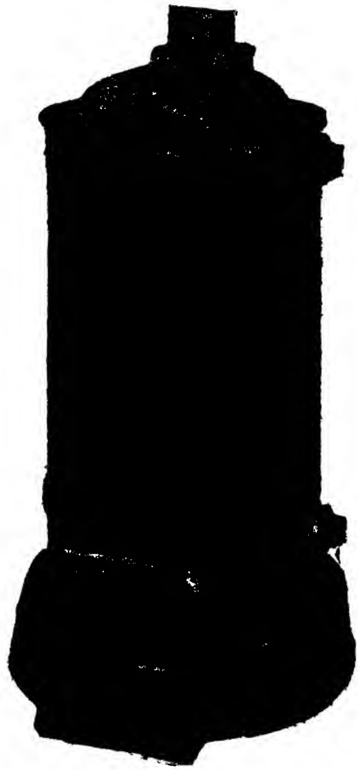
Diagram of a Boiler installed in the Hot Water Circulating System for Heating Brooders.

maintained with the set of the damper and draught plate as described above, it might be necessary to pull out the damper slightly more, or to allow a little more draught at the bottom. If, on the other hand, the fire is burning too fiercely, then the reverse operation of the damper or draught plates or both should be resorted to. Perfect control is possible in this way. The actual and continuous stoking from day to day will very largely be a repetition of what is here described, except that the fire should never be allowed to go out.

The Night Operation.

We may now assume that the heater is kept running steadily all day by means of firing at such intervals as may be required or as meets the convenience of the attendant. One thing, however, should be kept in view—a

good even fire should be ensured before the heater (boiler) is stoked up for the night. In passing it might be stated that the heater under notice will hold sufficient coke to last for ten hours if properly stoked. It is presumed, then, that the heater will be filled with coke at say 9.30 or 10 p.m. The first thing to do is to clean the fire bars of all ashes and dead matter that have accumulated on them, in order (*a*) to get a clean fire to start the new coke with, and (*b*) so that the fire will not be choked with ashes and clinkers before morning. The fire should not be disturbed after being made up for the night. On the attendant visiting the brooder house first thing in the morning the temperatures in the brooders should be ascertained from the thermometers in the brooding units. The fire in the heater should then be attended to, the bars again freed from ashes and dead material, and fresh coke put in. The day-time routine should then be followed. The fire in the heater should on no account be let go out, no matter how hot the day. If, however, there is no necessity, owing to the heat of the day, to supply heat to the brooders, the fire can be kept smouldering by manipulation of the damper and draught plate as already described.


The Boiler Described.

Temperatures.

Poultry-farmers of limited experience are often alarmed if the temperature in the brooder unit rises much over what I have set out as necessary for the different ages. However, no alarm need be felt at even a considerable rise of temperatures, providing always that the chickens can get out of the brooder if it becomes uncomfortably hot. Trouble will only be experienced if the chickens are confined to the brooder and cannot get away to a cooler zone; therefore the 95-90, 86-82, and 82-76 degrees for the respective ages, as mentioned in other matter issued on the subject, should be regarded as the minimum of safety, not the maximum allowable. It should be remembered that, however hot the centre of the brooder may be, there is a cool zone at the entrance immediately behind the curtain of flannel. On a warm night the chickens will even push outside in their search for comfort. However, no harm will come to them in this case so long as there is no impediment to their shuffling back into the warm brooder when they feel the cold. All will be well if the necessary warmth is there.

In short, if there are warm and cool zones to which the chickens have access all ideas of over-heating can be dismissed. Chickens simply will not stay where they are uncomfortably hot if they can get away.

Another class of heater which might be referred to, and of which there are many in use, is that in which the magazine is on top. Most of the instructions given here are applicable to this type of boiler also. On this heater a regulating device can be attached to the draught plate, and it regulates itself within certain limits. A thermometer is sometimes fixed on to the outflow pipe to indicate the temperature of the water that is passing into the circulation, but, since this is not a reliable guide to the temperature of the brooder units, it is probably better dispensed with. The thermometer is of doubtful utility in most cases, for the reason that there comes to be a tendency on the part of some attendants to trust too much to the heat of the water, and to grow careless or over-confident of the temperature in the brooder units, in which case trouble ensues. The average attendant is best served by thermometers in the brooder units, no matter whether they be of the box or the hover type.

Other Coke-heated Brooders and Incubators.

What has been said about the foregoing brooder heaters applies in a great measure to colony brooders, and also to Mammoth incubators heated by coke-burning slow combustion boilers, with this difference in the latter case, that one of the greatest difficulties in stoking is to keep the volume of radiation down within bounds consistent with having the fire always smouldering. In this case the fire has often to be banked down with ashes and the bars let go dirty in order that the fire be kept low without going out.

Some Essential Points.

One essential in these ground-level hot water circulating plants is that the pipes must be run on a dead level from end to end, and also that the pipes running parallel should be level with one another. Any rise or fall in the pipes will cause the circulation to be sluggish, and if very pronounced will prevent circulation. In these cases more coke will be used and extra stoking will be required for less radiation. These facts have been stated over and over again in literature issued from the Department, but there are still a number of brooding plants in work that are defective from this cause, and poultry-farmers are wont to blame the system rather than their own failure to make sure that everything is right.

A very frequent cause of this trouble is the sinking of one end of a brooder house floor, causing a fall in the pipe line. Another trouble is the advice given by plumbers, who often do not understand these level installations, and who insist on giving a rise to the end of the pipes. This comes of a confusion of ideas. For instance, if the boiler is placed in a pit below the level of the floor of the brooder house, then it is necessary to give a rise to the end of the pipes and to place the exhaust or expansion

pipe at that point. But the ground-level installation will not work satisfactorily put in that way, nor is it desirable, because brooders on the level are less troublesome.

Yet another common mistake is to place the supply tank too high. The position of the tank should be as seen in the illustration, on a level with the top of the heater. It may be any distance away, but the higher it is the less satisfactory will be the circulation. Another matter is that in cases where a ball-cock can be fitted to the tank on a regular water service, such as the city supply, a 15-gallon tank similar to a lavatory cistern will be large enough, instead of the 50-gallon one shown in the diagram.

When stoking any class of coke-burning heater, care should be taken as to the following particulars:—The coke should be free from dirt, fairly even in size, kept dry or nearly so, and it should be fed into the heater fairly compact without being rammed; ramming will cause the coke to jam and the fire will burn from under it. The heater should always be filled with coke at night, but it need not be filled during the day time.

Keep the Pipes Clear.

In the case of circulating plants that have been in use for some years, or where river or surface water is being used from which there may be deposits, the pipes may need cleaning to remove the sediment. A good way to do this is to disconnect the pipes at the boiler and connect up with the water service to flush out the sediment.

Maize Trial at Batlow.

A variety trial with maize was interplanted between 4-year-old prune trees by Mr. J. R. Quarmby, Batlow, in the past season. The ground had previously grown six crops of potatoes; 2 cwt. per acre of blood and bone had been used with the last crop of potatoes, but no manure was planted with the maize. The trees being 24 feet apart, five rows of maize were planted in each land, the soil being in perfect order. Drills were made with the plough about 3 inches deep and the seed dropped 3 feet apart at the end of October, 1924. The germination of all varieties was excellent. Heavy rain washed little furrows through the block about four weeks after planting, when the crop was 3 or 4 inches high. It was cross-harrowed just after this rain, and the cultivator was run through the rows when the crop was 18 inches high, and again when it was about 2 ft. 6 in. high.

The rainfall during growth was:—669 points in November, 177 points in December, 527 points in January, and 326 points in February.

The results were:—

Minnesota 23	19½ bus. per acre.
Sundown	21 ,, ,,
Golden Glow	26 ,, ,,
Early Morn	27 ,, ,,

Minnesota 23 was ready to harvest by the end of March; Sundown was fit to pick in the middle of April; Early Morn was next, and Golden Glow was still slightly green when picked. Had the season not been so wet Golden Glow would have done very much better. It grew by far the tallest stalk, Early Morn being next and Sundown third in height. Minnesota was quite a dwarf beside the other three.

Orchard Notes.

August.

W. J. ALLEN and H. BROADFOOT.

PRUNING may be continued during the current month, particularly on many varieties in late districts. In pruning great care should be taken to study the characteristics of each variety and the development of each tree. When young trees are planted they should be cut back hard. It should never be forgotten that the establishment of a sound and symmetrical framework in young trees is of paramount importance. A tree symmetrically developed with good, stout limbs can carry a well-distributed crop without undue danger of breaking; such a shape also facilitates spraying, and cultural and picking operations, and the tree has therefore an enhanced economical value to the proprietor.

Ploughing.

Winter ploughing should have been completed before this, but if it has not been done every effort should be made to complete the work as soon as practicable. The great advantages of early ploughing are that it puts the ground in the best condition to absorb winter rains, exposes the soil to the beneficial influences of winter frosts, and assists in decomposition of organic matter that has been ploughed in.

Planting.

The planting of deciduous trees can be carried out this month, but early planting is always desirable, as a tree placed early in its permanent position is making roots long before it shoots in the spring.

Citrus trees may be planted in localities where late frosts are unknown. In localities where frosts are likely to occur it is better to defer planting until any danger from frost is over.

Cherry and Peach Aphis.

Green and black aphis were very prevalent last season, and did a considerable amount of damage. Aphis not only interfere considerably with the current year's crop, but also interfere with the crop of the following year. The trees should receive an application of oil as late as possible before the buds burst in spring. The work must be thoroughly done, and a good force is absolutely essential to break up the aphis clusters. It may be necessary to follow with an application of a nicotine extract after the tree has commenced to shoot. Green aphis in particular is very difficult to control after the tree is in full leaf, as the presence of the aphis tends to make the leaf curl, and this envelopes and protects the aphis from the spray. Cherry aphis was also very prevalent in the main cherry districts, and every effort should be made to control it.

As a means of control the trees should also be sprayed with oil before the buds burst in spring. Where the aphis is limited to individual trees,

particularly in young orchards, and is confined to the tops of leaders, the affected parts should be cut away and destroyed by burning, and the tree sprayed with nicotine extract.

Manuring.

Up to the present no appreciable results have accrued from the application of artificial manures to deciduous trees in many of our fruit districts, but farmyard manure has in all cases proved beneficial. This is a good time to give citrus fruits a dressing of fertiliser; except in the case of sulphate of ammonia or nitrate of soda, which should not be applied until September.

Grafting.

This may be done in many districts later this month. Any unprofitable trees should be grafted with better varieties. This work should be done when the sap commences to rise and the bark lifts freely. A bulletin on budding and grafting may be obtained on application to the Under Secretary and Director, Department of Agriculture, Sydney; price, 10d. post free. This work should be carried out when the buds are well swollen, but before they burst.

Packing of Citrus Fruits.

Citrus fruits are now being forwarded in large consignments, and in many cases there is still plenty of room for improvement in the method of handling, grading, sizing, packing, and marketing of the fruit.

In packing, great care should be taken not to injure the skin. Many persons think that because an orange is protected by a somewhat tough and more or less elastic skin rough usage is not injurious, and so far as they can see this is so. The fruit is picked, packed and forwarded with little loss of time, but frequently during transit or whilst awaiting sale the result of rough treatment becomes apparent. Through skin scratches or punctures, rot organisms such as blue mould, enter and begin their destructive work, and in the aggregate take heavy toll of the crop. Growers should see that such loss is minimised or prevented by careful handling.

Quickness in handling does not necessarily accompany or result in carelessness and loss. In packing the fruit should be carefully sized and graded for quality. The cases should be lined with paper, as in many instances the interior surface of the case is rough, and is likely to cause skin abrasions to unprotected fruit with consequent entrance of rot organisms.

All waste or fallen fruit should be burnt or boiled at short intervals. This is of great importance, as it assists in minimising the depredations of certain insect pests and fungous diseases. This will be universally effective only when universally carried out.

Drainage.

Whilst effective drainage is beneficial to all land intended for cropping, it is absolutely necessary in certain areas. Generally those who purchase sites for orchards choose land which is naturally well drained, but even

then there are some areas which drainage would greatly improve. A better knowledge of the great benefits resultant from good drainage would lead growers to undertake the drainage of some, if not all, of their orchard lands.

Effective drainage results in improved conditions in respect to soil, air, and water, with resultant benefits to the vegetation involved; drainage therefore, if properly carried out, improves the potential productivity of the soil and enhances the value of the affected land.

Some of the benefits of drainage may be stated in greater detail as follows:—

Drainage removes excess of moisture from the soil. The primary object of drainage is to lower the water table by removing excess of free water from the soil, and to lead to the formation of air-filled pore spaces.

Drainage increases the capillarity of the soil, and this improves the supply of capillary moisture. Well-drained soil is in a better state of tilth than undrained soil, and therefore contains more pore space with, as a consequence, more room for air. The soil is aerated instead of being super-saturated; when the water table has been lowered there exists a deeper layer for aeration and storage of capillary moisture. This is all to the good as far as productivity is concerned. Well-drained soils are more retentive of moisture in drought periods than undrained.

Drainage improves soil texture and composition, and soils so treated respond more satisfactorily to cultural operations than undrained soils. Drained soils are more easily brought into a good state of tilth. Drainage encourages plants to root more deeply and to form good root systems, and thus ensures a larger reservoir of moisture and plant-food upon which the trees can draw.

Drainage improves air circulation. The removal of the water from the soil makes room for more air. As water is removed downwards and outwards from the soil, air follows and takes the place of the retreating water. Moreover, the presence of drains enlarges the area of soil brought into contact with air, and this is an important factor in connection with elaboration and liberation of plant-foods. Drainage makes the application of manure and fertilisers more effective.

Drainage makes the soil warmer. Wet soil is cold because excessive evaporation appreciably lowers temperature. Drainage by reducing evaporation maintains a better soil temperature.

Drainage firms the soil uniformly, and the whole area is fit for work at the same time.

Drainage assists the decay of vegetable matter in the soil and improves nitrification. Those processes require the presence of oxygen and nitrogen in the soil, and, as these elements are obtained from air, good aeration is absolutely essential to good nitrification. Super-saturation is inimical to the life and activity of nitrifying bacteria and is helpful to denitrifying bacteria.

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 18th of the month previous to issue. Alterations of dates should be notified at once.

1925.

Society.	Secretary.	Date.
Parkes P. A. H. and I. Association	L. S. Seaborn	Aug. 18, 19
Gosford A. and H. Association (Citrus Show)	C. W. Ironmonger	„ 22
Forbes P. A. H. and I. Association	E. A. Austen	„ 25, 26
Murrumbidgee P. and A. Association (Wagga)	F. H. Croaker	„ 25, 26, 27
Grenfell P. A. and H. Association	T. G. Wenham	Sept. 1, 2
Cootamundra A. P. H. and I. Association	W. W. Brunton	„ 1, 2
Albury P. A. and H. Society	A. G. Young	„ 1, 2, 3
Manildra P. and A. Association	J. Longley	„ 8, 9
Culcairn P. A. H. and I. Society	J. N. Douglas	„ 8, 9
Coolamon A. H. and P. Society	....	„ 8, 9
Young P. and A. Association	T. A. Tester	„ 9, 10, 11
Glenorie P. A. and H. Society	F. A. Nicholson	„ 12
Ganmain A. and P. Association	C. C. Henderson	„ 15, 16
Holbrook P. and A. Society	J. S. Stewart	„ 15, 16
Junee P. A. and I. Association	G. W. Scrivener	„ 15, 16
Cowra P. A. and H. Association	E. D. Todhunter	„ 16, 17
West Wyalong P. A. H. and I. Association	T. A. Smith	„ 16, 17, 18
Northern A. Association (Singleton)	S. Griffits	„ 16, 17, 18
Murrumburrah P. A. and I. Association	W. Worner	„ 17, 18
Canowindra P. A. and H. Association	J. T. Rue	„ 22, 23
Lockhart A. and P. Society	E. D. Arnold	„ 22, 23
Temora P. A. H. and I. Association	A. D. Ness	„ 22, 23, 24
Gunnedah P. A. and H. Association	M. C Tweedie	„ 22, 23, 24
Burrowa P. A. and H. Association	W. Burns	„ 29, 30
Henty P. and A. Society	J. Lovell	„ 29, 30
Barmedman A. and H. Society	T. P. Meagher	„ 30
Barellan P. A. and I. Society	H. H. Cuthbert	„ 30
Corowa P. A. and H. Society	J. D. Fraser	Oct. 2, 3
Hillston A. and P. Society	....	„ 2
Griffith A. Society	M. E. Sellin	„ 6, 7
Quandialla P. A. H. and I. Society	J. E. Gardner	„ 7
Ardlethan A. Society	R. L. Neill	„ 7
Hay P. and A. Association	C. L. Lincolne	„ 7, 8
Narrandera P. and A. Association	W. H. Canton	„ 13, 14
Ariah Park A. Society	J. F. McInnes	„ 14
Carcoar H. C. and A. Society	T. J. Brady	„ 14
Millthorpe A. and P. Association	T. P. Smith	„ 20, 21
Deniliquin P. and A. Society	P. Fagan	„ 21
Coraki A. and H. Society	....	„ 28, 29
Nimbin A. and H. Society	....	Nov. 11, 12
Lismore A. and I. Society	H. Pritchard	„ 17, 18, 19
Murwillumbah A. and H. Society	....	„ 25, 26
Coramba A. and H. Society	....	„ 25, 26

1926.

Society.	Secretary.	Date.
Albion Park A. and H. Association	H. R. Hobart	Jan. 1, 2
Dapto A. and H. Society	E. G. Coghlan	„ 15, 16
Kiama A. Society	G. A. Somerville	„ 26, 27
Wollongong A. H. and I. Association	W. J. Cochrane	„ 28, 29, 30
Mullumbimby A. and H. Association	....	„ 10, 11
Newcastle A. H. and I. Association	E. J. Dann	Feb. 23 to 27
Alstonville A. and H. Society	....	„ 24, 25
Blacktown A. Society	J. McMurtrie	„ 26, 27
Tumut A. and P. Association	T. E. Wilkinson	Mar. 2, 3
Bangalow A. and H. Association	....	„ 3, 4
Hunter River A. and H. Association (West Maitland)	M. A. Brown	„ 3, 4, 5, 6

AGRICULTURAL SOCIETIES' SHOWS—*continued.*

1926.

Society.	Secretary.	Date.
Yass P. and A. Association	E. A. Hickey ...	Mar. 10, 11
Ulmarra P. and A. Society	....	,, 10, 11
Manning River A. and H. Association (Taree) ...	R. Plummer ...	,, 10, 11, 12
Campbelltown A. Society	W. N. Rudd ...	,, 12, 13
Royal Agricultural Society	G. C. Somerville...	,, 29 to April 7
Clarence P. and A. Society (Grafton)	....	April 21 to 24
Maclean P. and A. Society	....	,, 28, 29, 30
Richmond River A. H. and P. Society (Casino) ...	....	May 5, 6, 7
Kyogle P. A. and H. Society	....	,, 12, 13
Bonalbo P. and A. Society	....	,, 27, 28

Orchard Manurial Trials on the Irrigation Area.

The question whether it is beneficial to apply artificial manures to the fruit trees on the Murrumbidgee Irrigation Areas has been engaging the attention of the Department of Agriculture, the Water Conservation and Irrigation Commission, and the growers' organisations in the area during recent years.

Experiments have been conducted on Mr. L. Brackenridge's farm (No. 729), at Leeton, thirty-seven rows containing 473 trees, and comprising Trevatt apricots and Alberta peaches, were placed under a trial on the following plan, the manures applied and the fruit harvested being as follows:—

Mixture.	Rate of Application per Tree.	Apricots.		Peaches.	
		No. of Trees.	Return	No. of Trees	Return.
	lb.		bus.		bus.
318 lb. superphosphate ... 87 ,, bone dust ... 46 ,, sulphate of potash ... 37 ,, sulphate ammonia ..	6¼	9	31	13	54
318 ,, superphosphate ... 87 ,, bone dust ... .. 37 ,, sulphate ammonia ..	5½	13	39	13	63
318 ,, superphosphate ... 87 ,, bone dust ... ... 46 ,, sulphate of potash ...	5¾	13	27	13	53
275 ,, superphosphate ... 75 ,, bone dust	4½	13	30	13	58
Unmanured	......	9	15	13	48

The apricots weighed out at an average of 50 lb. and the peaches 48 lb. to the bushel case.

Just prior to the beginning of the test the land received a general dressing of gypsum at the rate of 1 ton per acre, and it is believed that the application materially assisted the success of the trial. Mr. Beverley, Fruit Instructor, the departmental officer in charge of the trial, remarked that the fruit taken from the manured rows was better in flavour, sweetness, and size than that from the unmanured rows. He also stated that the fruit taken from the mixture first mentioned in the above table was better as regards general flavour and colour, but that the second mixture gave the best results.—W. J. Allen.

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Agricultural Gazette of New South Wales.

Horse Breeding for Farm Use.

E. B. COMANS, Hon. Secretary, Commonwealth Clydesdale Horse Society (N.S.W. Branch).*

ONE regrets to find that so little attention is being devoted to-day to horse-breeding interests, other than those associated with the turf. How seldom do we see any practical articles relating to horse improvement! How rare are the reports of horse affairs in other parts of the world! You are not told of the successful sales of Clydesdale horses which have been effected in this State or in Victoria—aged stallions commanding as high as 750 guineas, two-year-old colts and fillies 450 and 500 guineas, a five-months' colt 150 guineas, nor of the purchase in New Zealand by a South Australian farmer recently of a stallion for 750 guineas, and two mares, a four-year-old for 350 and a three-year-old for 300 guineas. But if a lot of unfortunate "pink eye" victims from Queensland, unbroken at six and seven years of age, are sold at an average of 10s. or 20s. a head, you will find such a sale most prominently reported.

Instead of every effort being made to encourage the use of the horse and the preservation of an important branch of our primary industries, the opposite is being done. This opportunity is therefore welcomed of getting into direct touch with farmers and horse-breeders, and placing before them evidence which, it is hoped, will serve to show that the horse still asserts, and will continue to assert, a very big influence in the development of our country. While this may be diverging somewhat from the subject of horse-breeding for farm use, yet I venture to regard it as of particular importance.

With practical men, it is not necessary to go too deeply into the subject of selecting breeding stock, or the rearing, feeding, &c., of draught horses, but before dealing with those matters we may consider some reasons why we should breed horses.

Power on the Farm.

Farming by tractor power is in its infancy in Australia to-day. Whether it will prove to the financial advantage of the farmer or otherwise, time alone will prove. No investigation of an official nature into the costs and so forth of "power farming" has been made here, and consequently it is difficult to form a correct estimate of the value of this method of farming. A ploughing demonstration for a day or two in the field or a reliability test for advertising purposes are of no value to the farmer. He wants a practical demonstration with the same tractor spread over at least three years, and the work to be carried out under the same conditions as

* Paper presented at Third Annual State Conference of Agricultural Bureau, Hawkesbury Agricultural College, July, 1925.

operate on farms worked entirely by horse-power. Careful costs of all operations, including cost of tractor, wear and tear, depreciation, &c., together with the period of practical usefulness of the tractor in the field, should be taken into account.

The Horse Position in the United States.

The United States furnishes a splendid example of the indispensable nature of the horse in all classes of agricultural, commercial, and transportation work, as well as for defence and pleasure purposes. It is the only country, too, which has gone most carefully into the question of horse usage, and the investigations of the Horse Association of America indicate that the horse is absolutely indispensable in many classes of work.

Statistics are more valuable. In 1914 there were 24,876,000 horses and mules in the States. During the war period approximately 1,400,000 horses and mules were exported to Europe. The American farmer and horse-breeder experienced a most depressing time after the close of the war, and, as in Australia, both horse and cattle breeding suffered. Cattle figures suffered most, as there was a decline of 8,000,000 beef cattle between 1921 and the end of 1923. The latest horse returns are encouraging, as on the 1st January of this year, the Federal Department of Agriculture estimates were:—17,589,000 horses and 5,411,000 mules on farms, and approximately 2,000,000 horses and mules in non-agricultural work. This makes a total of 25,000,000 horses and mules in the United States. When it is remembered that there are over 17,000,000 motor-cars and trucks in use in that country, it will be realised that the position of the horse and mule is highly satisfactory, and is a magnificent tribute to their value in all classes of work.

Canadians Great Horse Users.

Canada has always been a great horse country, especially in breeding a good class of draught animal, and the active manner in which horse-breeding is being carried on in Canada is strong proof of the economic value of the horse in all classes of work. Canada produces a draught horse of very good standard, as she has always been a big importer of Clydesdales from Scotland. Encouragement and assistance has for many years been given to horse-breeding by the Dominion and Provincial Governments by means of grants to assist districts to secure pure-bred sires, and by legislative means providing for the registration and licensing of all stallions. Some provinces have legislation so far advanced that they now license only pure-bred stallions.

Within the past three months a shipment of forty-five stallions on account of one owner was landed in Canada, which is a good indication that horse-breeding is not a thing of the past. Another notable shipment of horses was on account of a Winnipeg firm of brewers, who imported from Scotland five prize geldings which cost in Scotland an average of 200 guineas each. These were a particularly fine lot of horses, and should

prove a wonderfully good advertising medium for their owners. It evidently has done good work for the Clydesdale breed, as since then another Scottish breeder has been commissioned to procure a draft of geldings for Germany.

The "Inefficient" Horse.

Sufficient has been said to show that the day of the horse is by no means past Time and again this bogey has been trotted out, and still the horse is with us, and there is no reason to expect him to become a back number in our affairs. The day of the "inefficient" horse is, however, numbered. Horse users to-day want a better article, and horse-breeders must keep abreast with the demands of the times, and produce the class of goods which is wanted and sells best. The carriers, merchants, and brewers of Sydney complain of the great difficulty they have in securing horses of the right class for their work. The markets are flooded with under-sized, scrubby types for which there is no demand. Farmers should be in a good position to breed the class of horse which is wanted in the city, as by breeding a few they can give them more attention and so help their development. The horse with weight, good appearance, and with hard, flat bone and sloping pasterns is the sort required. The best class of draught horses in Sydney is to be found principally in the brewery lorries, and it would be a good education for any farmer or horse-breeder when in Sydney to visit the stables of the brewers and inspect the horses. They would then see for themselves the class it pays to breed. Every country visitor to Sydney should, also, visit Sussex-street and Darling Harbour railway yards, as in those quarters a wealth of horse-power is to be found. Many farmers never see this part of the city, but because they see a large fleet of motor-cars about the streets, they go back home seized with the idea that there are no horses in Sydney. Actually, the greater part of the carrying and delivery work of Sydney is done with horses.

The Need for Better Horses.

There is a demand to-day for good horses, a fact which cannot be too strongly impressed on breeders. The city user wants a better standard of animal and the farmer also wants a more efficient horse. The satisfaction of this requirement lies in the hands of the horse-breeder. Is he, by breeding a bad, nondescript type of horse, going to discredit horse-breeding, or is he going to produce a horse of better standard which will give more efficient service on the farm or in the city? By breeding nondescript animals, sending them into the city markets in an unfit state, and expecting top prices, sellers show a great lack of business acumen. No wonder carriers and others who are anxious to procure good horses get disgusted and turn their attention to motor power.

The average horseman in this State has shown a great deal of apathy in all matters connected with the breeding of horses of higher standard. While legislation to prohibit mongrel and unsound sires is desirable, or

rather essential, there is no reason why breeders should wait for Government action before trying to do something for the improvement of horses. Pure-bred, sound stallions of good conformation should be in greater demand, and every encouragement should be given to owners of such animals, and, if only the best mares are bred from, the progeny will develop into animals which will give greater satisfaction to those who use them, and breeders will have no cause to complain about horse-breeding being unprofitable.

No Horse Policy.

It is a singular thing, but throughout Australia there has never been any thoroughly general principle in regard to horse-breeding. Some of the States have stallion registration in force, but there is no determined scheme or policy to encourage horse-breeding or to assist horse-breeders.

The breeder to-day can go his own way, and breed from any class of mare and stallion. Nothing is done to help him or the industry, which is worth something like £7,000,000. Almost every country in the world—even in the United States of America, where motor-power is numbered in millions, they have definite schemes to aid, encourage, and assist horse-breeding.

Most of the American States and Canada have had stallion legislation in force for many years, but not content with merely carrying out the letter of their Acts they have gone further and arranged conferences of horsemen. The officials go about various centres giving lectures and demonstrations, and very practical leaflets and reports are distributed. The result is that these States to-day have an overwhelming majority of pure-bred stallions; they have graded up their horses to a higher standard, though the Percheron, the predominant draught breed in America, is, in the eyes of the Clydesdale fancier, a defective horse about the legs and feet. A very determined and practical effort is thus being made to improve the standard of the draught horse in America. During the war the United States exported nearly 1,000,000 horses and 500,000 mules to Europe, and the facility with which she obtained such numbers was due to the results of some definite policy of horse-breeding and horse-improvement which the States of the Union, and the Federal and State Departments of Agriculture and the War Office had been, and still are, carrying out.

With us here nothing has been done. This State is not making the progress it should. The southern districts only—principally the Riverina—have made a substantial improvement in their heavy horses. It is in these districts we find our principal stud breeders, and it is satisfactory to record that during the past four years there has been marked increase in the number of small studs. It is a striking feature of the horse-breeding industry, that men who are breeding the best class are the ones who are most optimistic as to the future of the horse. These breeders, perhaps by reason of their better ideas of stock raising, realise the worth of a good horse for farming operations. Likewise, the city carrier knows how to appreciate a horse of good standard. Horses with a large infusion of Clydesdale blood, possessing good underpinning, are always an asset to

their owners. They are capable of performing their work without difficulty, and stand up to the wear and tear of hard city life, which is a great test of the wearing qualities of the draught horse.

Some few months ago the Master Carriers' Association approached the Minister for Agriculture, urging the introduction of the Horse Breeding Bill, as, in view of the difficulty of securing good classes of draught stock, they considered it was highly essential to eliminate undesirable stallions from public service. In course of conversation, one of the leading master carriers remarked that "good blood in the draught" was very necessary. In the eyes of carriers, he said, it gave horses more vigour and stamina, besides having the better wearing leg and foot.

Draught Horses an Asset.

The lack of progress and improvement in horse-breeding in this State is, to a great extent, due to the use of sires deficient in breeding and quality, and the failure on the part of owners of mares to recognise the necessity for patronising pure-bred, sound sires of good conformation. The neglect, too, to adopt a more rigid culling of breeding mares is a big contributing factor, and to this, and to the use of undesirable sires, is consequently attributed the low standard of horse, which on account of showing unprofitable results, has led to decreased breeding.

Draught horses are a big and valuable asset, and everything that can be done to improve their standard, to increase their value, and to render them more efficient for the work for which they are intended, should be adopted. The greatest menace to the industry in this State—in fact, in Australia—has been the cheap stallion, and it is a fact to be deplored that for the past twenty years successive Governments have failed to bring into force such legislation as would help to eliminate this class of animal from use. The breeder himself is, however, largely to blame, on account of his shortsightedness in patronising such horses and encouraging their use, simply because they are to be had for a small fee. Anything cheap in the horse line is dear in the long run. If breeders would realise that "like begets like" they would know that the union of the average farm mare with the cheap nondescript sire, lacking in breed-type and quality, must result in progeny which can, at best, be no better than either parent—a foal which can grow only into an indifferent horse—lacking desirable working qualities, and, on account of its poor type, of little value in the sale ring.

Success in breeding any class of live stock cannot be achieved unless the breeder has some high ideal to aim at. This does not mean that it is necessary to go striving for high-class stock too early in one's career. It can be achieved by the principle of "grading up," that is, by mating one's mares with pure-bred, sound, well-conformed sires (always of the same breed), together with a full appreciation of the value of mares of good type and breed character. Breeding on these lines results in an improved standard being attained at each successive generation, and eventually, by following out this principle, the breeder arrives at the stage of having pure-bred horses.

It is not a costly proposition, as, by using judgment in the selection of foundation mares, one can get together some very creditable types, possessing pleasing conformation, with a good degree of breed, character, and size, and with good legs and feet. Preferably select young mares, and if they turn out good breeders they can be retained for a few years and then sold without any loss, in addition to which the farmer has probably had a few foals to the good. Very often farmers are tempted to purchase brood mares at auction sales—mares which are being culled out of studs—and the ambition to put together a small stud of pure-breds is killed. Young mares with years of useful service, both in the collar and at the stud, are a sound investment at all times.

As a business proposition, it pays to breed mares to pure-bred sires. The service fees are larger, but, on the other hand, the foal got by a pure-bred sire and properly cared for and developed will be worth double (or more) the value of the progeny of the mongrel sire. One has only to go into the sale-ring to-day to find that if there is a good, weighty draught horse showing breeding and quality, it will command more notice and better bidding than any other animal in the yard.

Selected mares bred to pure-bred sires enhance the profits of the farmer. They help to stabilise the horse-breeding and agricultural industries, and it will always be a wise policy for the farmer to keep none but good mares on his place. Full appreciation of their services must be recognised, and while they are rearing foals and engaged in the work of the farm they should receive extra care and management.

The Clydesdale.

I should like to stress a few points in connection with the Clydesdale, especially in regard to the stallion, as unless one employs a sire of good character and breed-type it is idle to expect a horse to get stock of good class. Every draught-horse breeder should make himself familiar with the main points of the Clydesdale, the dominant draught-horse breed in Australia, by keeping before him photos of worthy members of the breed and by visiting the principal show-yards and studs. It is surprising how often one hears of animals described as Clydesdales which have hardly one characteristic of the breed in the whole of their make up. What a number of such ill-bred brutes there are advertised every season as "pure-bred Clydesdales," and yet nothing is done to prevent such misleading advertising.

Now, a Clydesdale, like any other breed of horses, should have good conformation, by which I mean the whole make-up of the animal should be of a pleasing nature, and each part moulded smoothly into the other, so as to give an even outline. According to the size of the horse, so each part should be in proportion. In the stallion a horse of good size should be looked for, provided that "size" has not been obtained at the expense of other essentials, such as soundness of limb, quality, and breed character. In the old days, in fact, up to recent times, the greatest recommendation one could give a horse, particularly a stallion, was to say he was a

"big horse, with immense bone and an abundance of hair." While such animals got "big" stock they also imparted very defective legs and feet, and the presence of "grease" and bony growths was very common. "Abundance of hair" is no longer regarded as a desirable quality, and in the Clydesdale the Scottish constructive breeders have given us an animal with the hair practically confined to the rear tendon, with a nice "spat" round the hoof head. This hair, or feather, is an indication of the quality of the leg and bone; the finer the hair the better and denser the bone, while coarse hair of a curly nature and growing all round the cannons is an indication of spongy bone.

Clydesdale fanciers are frequently twitted for the stress they lay on the leg of the breed, but when it is realised how important the leg and foot are in the work horse, it will be seen that there is good reason for giving so much consideration to this point. Knee and hock joints should be large and cleanly cut; that is, they should clearly show the bones under the skin, and be free from fleshiness. The points of the hocks should be turned slightly towards each other. A horse wide between the hocks is of faulty structure, and in the strain of pulling is likely to turn the hocks outwards, and in so doing loses a certain amount of power. Hence the reason why the Clydesdale has been bred with hocks close together. One needs to be careful, however, not to confuse "close hocks" with cow hocks, which is an entirely different thing, and in the horse would be regarded as a fault. Cannons should be hard, dense, and flat; fetlocks large and clean, pasterns sloping (the hind pasterns not at such an angle as the fore), large hoofs, with plenty of room round the hoof head, and wide heels. As I have said before, the feather should spring from the back of the leg and be of a silky nature.

It is not necessary to enlarge upon the other points of the horse, but I would urge the need of care when selecting a horse for draught purposes, especially for breeding, and the avoidance of any animal defective in conformation, any unsoundness, or a bad disposition. Look for good action. A smart, snappy walk and trot are just as essential in the draught horse as in the harness horse, and to-day there is greater need for a draught horse which is able to cover the ground at a fair pace. A horse which is naturally active is not liable to tire like a sluggish horse, which has to be "driven" all the time when at work. In this respect the Clydesdale holds a high place, as it is naturally an active breed, with good, clean action. The quality of bone, set of pasterns, and the open hoof head add considerably to its value, as these features increase the power of endurance of the horse.

Feeding.

A breeder may have first-class mares, and he may breed them to sires above the average, but unless he realises the importance of generous feeding to the brood mares and foals his efforts to produce good, well-developed horses will be sadly hampered. Feeding should be regarded as of equal importance to breeding, but we know that it is far from being recognised, and as a result of the neglect to feed breeding stock and the growing animals our markets to-day are over-supplied with undersized animals for

which there is no demand. This is why many breeders cannot command payable prices for the horses they raise, and then they say "horse-breeding does not pay." Horse-breeding will, and does, pay the man who uses good breeding stock, and who does not grudge giving chaff or grain to the brood mares and foals, especially during the winter or in dry seasons. It has become a saying that "the cheapest fuel is that grown on the farm," and a breeder should reserve a liberal supply for his horses, which should produce all the farm power he requires and his surplus stock will help to add to the profits of the farm.

Interest the Boys in Horses.

One great thing which needs to be done is to interest the young man in horses, because of the increased tendency to-day for the rising generation to spend too much time tinkering with a motor when such time could be more profitably given over to the care of some good brood mares, which would be a source of profit as well as pride on a farm. I would advise farmers to-day to give each of their boys at least one good mare, so as to stimulate interest in horse-breeding and encourage them to appreciate the value of a good brood mare.

Cultivate also in them a practice of visiting the horse-sale rings. This will broaden their knowledge of the horse and act as a good training for them, and also teach them to study market needs. The best horses command the best prices, and if the lads have this driven home when young, and if they have any business acumen, they will soon realise how to go about breeding the class which pays. To-day this fact is slowly but surely taking hold of our horse-breeders, who now realise that on account of motor competition the demand is for a better standard of horse. Moreover, the farmer himself needs the *best* horse. Impress this on the rising generation.

In conclusion, I would urge upon every farmer the need for breeding a few foals each year. I think I have given in this paper evidence which goes to show that the horse is a very indispensable animal, not only on the farm but in the commercial and transport world.

The future lies mainly with the breeder. It is for him to decide whether or not he will fall into line and satisfy the requirements of the horse-user, or whether he will go on in the same old way, breeding the same nondescript, ill-developed sort, and, as time goes on, forcing the horse-user to adopt another form of power.

Return of Infectious Diseases Reported in July.

The following is the return of outbreaks of the more important infectious diseases reported during the month of July, 1925:—

Anthrax	1
Pleuro-pneumonia contagiosa	2
Piroplasmosis (tick fever)...	Nil.
Swine Fever...	Nil.
Blackleg	3

—Max Henry, Chief Veterinary Surgeon.

Opportunities for Educational Co-operation

Between Agricultural Instructors and Branches of the Agricultural Bureau.

H. BARTLETT, H.D.A., Senior Agricultural Instructor.*

During the early days of the Field Branch of the Department of Agriculture, the path of the field officer was beset with many difficulties, calling for sympathy, tact, careful blending of theory and practice, and close observation and investigation in overcoming them. The one-time prejudice against the so-called city farmer has been overcome and has ceased to exist, as practical men have been induced to conduct experiments on their own farms under the supervision of departmental officers, thereby laying the foundation upon which such officers based their recommendations.

The officers who thus paved the way had to determine results by field trials, maintaining close supervision, and keeping accurate records before recommendations could be made to displace the old-established order of farm practice. The proportion of progress to the amount of work performed by these officers may have appeared small at the time, but by breaking down prejudices, gaining the confidence of the rural community, and accumulating knowledge for future use, they have made the work of the present-day instructor—not lighter—but more pleasant, and more replete with progressive results.

Additional Instructors Necessary.

The demand for additional instructors, and the work they represent, is heard from all districts, and it is possible that additional appointments will someday be made to the field staff, with a subsequent allotment of a smaller territory to each instructor, making possible a speeding-up in the method of instruction.

Large districts retard efficient work, as overhead expenses, such as travelling costs, wasted time in travelling, and insufficient concentration on certain centres, or on a particular phase of farming, are out of all proportion to the results attained. With the allotment of small districts, say, with a radius of 30 or 40 miles, the instructor soon becomes thoroughly conversant with the territory, and is able to concentrate on those farm practices most in need of improvement.

Increase the Average Production.

An instructor, when appointed to a workable district, naturally looks for the ways which will give the greatest progressive results for the work which he is able to perform. The soundness of a district is judged by its

* Paper read at Conference of Agricultural Instructors of the Department of Agriculture, Sydney, 30th June, 1925, and also at Third Annual State Conference of Agricultural Bureau, July, 1925.

average production, and it is here that the instructor will find his chief work. Increase the average production; help the farmers who are producing below the average; bring them into close touch with the methods which are likely to produce 100 per cent. crops; but, at the same time, work with the top-notch farmers, proving suggestions which may increase *their* crops also.

Demonstration Areas.

An instructor's duty is, primarily, to instruct, making known the already proven factors that contribute to increased production; and, secondarily, to determine practical means of still further improvement by simple experiments well within the range of farm practice.

Thanks to the work of the officers in past years, the Department has an abundance of records of proven factors, which, if generally adopted, would considerably lift the average production, and the need of carefully conducted experiments to aid in this work is not now nearly so urgent as it was in earlier days. What is really needed is propaganda and publicity, especially by means of practical demonstrations.

Give every farmer the opportunity of viewing crop growth under the conditions advocated. This may be accomplished by establishing demonstration areas at short distances from each other throughout the district, by inviting the local farmers to meet once or twice during the growing season at the sites, and by making known the results per medium of addresses and the press. As there are probably six or more ways in which the production of any one crop may be lifted above the average, and as each way needs to be demonstrated at all centres, it is evident that an instructor cannot personally supervise the planting, growth, and harvesting of all these areas.

To carry out the second phase of his work, i.e., increasing the present maximum production, the instructor may establish carefully conducted experiments with the most successful farmers, to which personal supervision must be given. It is therefore necessary to secure widespread assistance and co-operation, which is readily available through the numerous branches of the Agricultural Bureau.

The suggestion is that the instructor should consider the Bureau as a unit, making it responsible for the demonstrational and experimental areas; the Bureau to be instructed in all matters appertaining to the areas, and all farmers who are doing the work to be visited two or three times per year, thus keeping in personal touch with them.

Co-operating with the Bureau.

The details here discussed have special reference to a district situated in the wheat belt.

It is suggested that each branch of the bureau appoint a committee of five members, to be known as the Experiment Committee, of which the

president and secretary of the bureau, and the agricultural instructor shall be members, the president being the chairman of the committee This experiment committee would control all demonstrational and experimental areas; it would approve of all details, allocate the areas, and see that the experiments were conducted in the best interests of the bureau. The bureau would arrange field days, when the areas would be inspected by members. Records of all results would be held by the experimenters, the bureau, and the agricultural instructor.

Suggested Plot Areas.

In all cases the farmers would supply the required superphosphate, and (excepting for the pure-seed wheat areas, pure-seed oat areas, and two varieties in the wheat variety trial), all seed requirements. All land should be well worked fallow.

Pure-Seed Plots.—The Department might supply 3 bushels of stud seed of the four varieties of wheat most in demand in the district, and named by the bureau. The farmer selected by the bureau would sow the seed, and then its product, on well fallowed land, and sell graded pure seed at a reasonable increase above the f.a.q. price of wheat. Similar conditions could apply to pure-seed oat plots.

Wheat Variety Trial.—The Department could supply 2 bushels of at least two varieties, preferably recent introductions. Bureau members to supply 2 bushels of the wheats they desired tested. At least two trials should be established, one for early wheats and one for later wheats. A combined trial of the best from each section is recommended.

Seeding test (applying various amounts of seed per acre), fertiliser trial (applying various amounts of superphosphate per acre), and crop harrowing test could also be conducted.

Cultivation experiments might be arranged, such as (*a*) testing the effect of summer fallow (cultivation prior to winter ploughing), and (*b*) cultivated fallow (fallow not ploughed), and also frequently worked fallow against fallow receiving minimum of workings.

Fallow against stubble-sown land would need no demonstration, but other areas to demonstrate certain phases of farming might be necessary in certain localities.

Recording the Results.

Interest in an area increases when full responsibility is placed upon the farmer, particularly as regards recording results. When areas are under the observation of an experiment committee, every effort will be made to keep complete and accurate records. Comments by the farmer when submitting his results will be of value. The only workable way to secure records of a large number of such areas is to place the responsibility on the farmer. This, of course, does not apply to purely experimental areas, which require to be under the close supervision of the instructor.

For recording results, three copies of a record card may be supplied for each area, each of which the farmer will complete, retaining one, and the bureau and the instructor each receiving one.

The record card will ask for all necessary information, and will be suitably spaced to allow room for recording particulars. A specimen of the record card follows:—

RECORD CARD.

Name:— *Address:—*

Nature of Experiment:—

Plan of Experiment.

Previous Crop, Year,

Treatment of Stubble,

Type of Soil,

Cultivation and Stocking of Fallow,

Condition of Seed-bed,

Date Sown, Variety,

Seed per Acre, Manure per Acre,

Seed Treatment,

Notes:—Germination and Growth,

In addition to the above data, the back of the card provides (1) for general comments; (2) for the record of monthly rainfall during both fallowing and growing periods; and (3) for the tabulationof the plot numbers, area of each plot, plot yields, and acre yields.

Field Days.

The greatest opening presenting itself for demonstrating results occurs when field days are held. Each bureau would have six to eight members conducting experiments, each of whom would appreciate an inspection of his plots. Practically all farmers now possess motor-cars, and there is no difficulty as regards transport. Two field days are suggested, one about the end of August (which is a slack period on the farm), and the other when crops are turning colour.

The bureau would arrange an itinerary, enabling probably six areas to be visited in the day, naming the time and place of meeting. A cordial invitation could be extended to the ladies, with a suggestion that lunch be partaken of at a certain spot, where hot water would be in readiness. At the meeting place the instructor would take charge, pilot the gathering throughout the day, explaining the experiments, giving the results obtained in past years, and the probable results for the present year.

If only an afternoon outing was arranged, three or four places might be visited, to which the ladies might again be invited, and hot water could be ready at 4 p.m. The ladies and children would enjoy the day, and appreciate the instruction equally with the men. It might be mentioned that on two occasions last year 120 and 130 people attended such afternoons at Tichbourne.

Yield Judging Contests.

It is felt that on some occasions true differences in yield between plots is insufficiently registered at the time of inspection, and the suggestion is made that yield-judging contests might be held to counter casual observation. Such contests might be held when inspecting trials, such as manurial and wheat variety. An entrance fee of, say, 1s., might be charged, and a card as per specimen supplied, the entrant filling in the particulars.

After completing the estimated yield of the plots in each area the competitor would hand his card to the secretary of the bureau. Upon the actual yields being supplied, the secretary would fill in the points, which would be the difference between the actual and estimated yields.

The entrant scoring the fewest points—in other words, the one whose estimates were nearest to the actual yields—would be the winner. Cash prizes might be awarded thus:—First, 60 per cent. of entrance fees; second, 30 per cent. of entrance fees; third, 10 per cent. of entrance fees.

YIELD-JUDGING CONTEST CARD.

Bureau ....

Name ....

Address ....

....

Plot.	Estimated Yield.	Actual Yield	Points.
	Bus. lb.	Bus. lb.	

With instructional work organised somewhat on the above lines, an instructor will have time to follow up matters of interest not directly concerned with those areas occurring on farms during sowing and harvest time. He will probably find time for judging crop and fallow competitions, inspection of pure seed areas, and many other matters within the scope of his duties.

It is also felt that the personal interest of the bureau members in such work, the factors demonstrated for crop improvement, the accessibility of accumulated results over a number of years, and the opportunities presented for social intercourse will considerably strengthen the bureau movement.

Time of Ploughing for Late-sown Maize.

G. NICHOLSON, H.D.A., Experimentalist, Grafton Experiment Farm.

EXPERIMENTS carried out at Grafton Experiment Farm last season with late-sown maize support the conclusions arrived at in relation to early sowings (see *Agricultural Gazette*, July, p. 465), namely, that the returns amply warrant the practice of early as compared with late ploughing. The experiment was composed of three plots. Nos. 1 and 3 were ploughed on 2nd July, and disc-harrowed on 17th July and 8th August; No. 2 was ploughed on 11th September. All succeeding cultivations were identical, viz., disc-ploughed 26th September, disc-harrowed 30th September and 23rd October, and springtoothed just prior to sowing. The rainfall for the period between the first ploughing and sowing on plots 1 and 3 was 1,185 points; on plot No. 2 it was 459 points. Thus slightly over 7 inches more rain fell on the winter-ploughed plots; the absorption of moisture was greater and at a quicker rate than was the case with the unploughed plot. At planting the land was in good order and well supplied with moisture. The winter-ploughed plots were in better condition inasmuch that no half-decomposed maize stalks were present; otherwise very little difference was noticeable.

The experiment was planted on 5th November. Germination was good and even throughout all the plots; and there was no marked difference in the growth of the plots during the early stages, but during February the winter-ploughed plots showed to advantage, were of much better colour, did not burn off so quickly, and were less affected by the hot weather. This was no doubt due to a better supply of moisture being made available to the plants, through the absence of air pockets caused by partly decomposed maize stalks allowing freer capillary action.

Harvested on 20th May, the spring-ploughed plot yielded 53 bushels 8 lb. per acre, as compared with 68 bushels 42 lb. from the winter-ploughed plots, a difference of 15 bushels 34 lb. Reckoning maize at 3s. per bushel, the value of the increase was £2 6s. 10d., and deducting the cost of the two additional cultivations received by the winter-ploughed land (estimated at 2s. 3d. each) there was a nett gain of £2 2s. 4d.

This experiment has now been running for five seasons, over which period the winter-ploughed plots show an average increase of 12 bushels 17 lb. per acre. The points in favour of early ploughing may be enumerated as follows:—

1. It allows of a more thorough decomposition of the maize stalks which go to form humus.
2. It increases the moisture-holding capacity of the soil.
3. It improves the texture of the soil through physical causes.
4. It permits of improvement of soil texture by mechanical means.
5. It increases the available plant-food.
6. It checks the increase of weed, insect, and fungous pests.
7. It results in increased yields in all seasons.

Inverell Maize-growing Contest, 1924-25.

C. McCAULEY, Agricultural Instructor.

A CONTEST, the object of which was to determine the most suitable variety or strain of variety of maize for the Inverell district, was again carried out by the Inverell P. and A. Association last season. Twenty-one entries were received, including six non-competitive entries by the Department, sowings being carried out on the farms of Mr. A. E. Cosh, The Wattles, Mount Russell, and Mr. H. Ditzell, Dog Trap, Inverell.

The soil on the first-mentioned farm is a black heavy loam, previously cropped to wheat in 1922 and grazed in 1923. The land was ploughed 4 inches deep and harrowed on 5th March, 1924, harrowed 20th July, and re-ploughed 16th August and 28th September. The seed was sown through an attachment on a plough on 13th October. The rows were cultivated on 10th November, 14th December, and 15th January. The plots were kept clean throughout the growing period.

The soil on Mr. Ditzell's property consists of a black alluvial loam, previously cropped to wheat in 1923. The land was ploughed during April, 1924, and reploughed during July, September, and just prior to sowing. The seed was sown (through an attachment on a plough) on 20th November. The rows were cultivated on 2nd December, 28th December, and 20th January. The plots were kept clean throughout the growing period.

RESULTS of Contest.

Variety.	Yield per acre.					
	Mount Russell.		Inverell.		Average.	
	bus.	lb.	bus.	lb.	bus.	lb.
Funk's 90-day (Department of Agriculture) ...	47	10	48	40	48	1
Kennedy (Department of Agriculture)	46	3	49	10	47	31
Funk's Yellow Dent No. 1 (A. E. Cosh)	45	0	46	40	45	45
Wellingrove (A. E. Cosh)	46	3	39	0	42	26
Funk's Yellow Dent (F. Crawford)	36	21	43	15	39	43
Funk's Yellow Dent (Department of Agriculture)	38	10	41	20	39	40
White Prairie Queen (F. Maher)	38	28	39	15	38	46
Hawkesbury Pride (W. Taylor)	35	34	40	45	38	14
Fitzroy No. 2 (R. W. Barr)	33	37	40	45	37	6
Fitzroy No. 1 (R. W. Barr)	34	35	37	0	35	42
Funk's Yellow Dent No. 2 (A. E. Cosh)	35	34	35	20	35	27
Iowa Silvermine (A. E. Cosh)	36	4	30	45	33	24
Funk's Yellow Dent No. 3 (A. E. Cosh)	36	21	28	40	32	30
Shannon Vale (Department of Agriculture) ...	34	14	26	35	30	24
Bailey (Department of Agriculture)	36	21	19	45	28	8
Iowa Silvermine (J. H. Kerr)	......		42	0	......	
Funk's Yellow Dent (H. Ditzell)	......		41	5	......	
Golden Superb (G. Ditzell)	......		36	45	......	
Eureka (A. M. McGrath)	......		32	35	......	
Iowa Goldmine (Department of Agriculture) ...	42	7	......		......	
Early Morn (A. E. Cosh)	41	7	......		......	

As a whole, the season was unfavourable for maize-growing. The weather conditions from October to January were ideal, but abnormally dry; hot weather set in during February, which caused the plants to suffer a severe check. Sufficient rain fell during March and April to fill the grain. The rainfall was as follows:—

	Mount Russell.	Inverell.
	Points.	Points.
October	99	...
November	358	46
December	195	288
January	210	367
February	40	106
March	134	118
April	30	62
Total	1066	987

For Control of Slaters.

For control of the garden pests colloquially known as "slaters," the usual recommendation elsewhere is to dust slices of potato and carrot with paris green and place these in the haunts of the insects. Departmental experience of this and other methods, however, has found the best control to be obtained by the use of sodium fluoride—a somewhat expensive substance, but one which has proved effective if dusted lightly on the ground but not directly on to the plants. A few boards set out in damp places on the infested area will attract hundreds of the slaters, and by periodically lifting the boards and dusting lightly underneath the pest can be appreciably reduced. The material mentioned is poisonous, but not corrosive. Where it is to be used on a large scale it might be advisable to dilute it with some inert matter, such as dry slaked lime dust, using 1 lb. sodium fluoride to 1 to 3 lb. lime.—M. B. Gurney, Government Entomologist.

To Control Blue Mould of Tobacco.

Blue mould of tobacco is due to a fungus (*Peronospora* sp.), and makes its appearance particularly in seasons when the rainfall is excessive. Methods of control must aim at preventing conditions favourable to the development of the disease. They may be summarised as follows:—

1. Prepare a number of seed-beds, suitably manured, so that the young plants may quickly become established.
2. Sow these beds at intervals of two to three weeks.
3. Do not over-water the young plants; excessive moisture favours the disease.
4. Allow the young plants plenty of air and sunlight. Plants grown under hessian are more liable to develop the disease than those grown under straw.
5. Transplant at the earliest opportunity.
6. If the disease makes its appearance in any one of the beds, pull up and burn the infected plants immediately, and spray the remainder with Bordeaux mixture (2-2-50).

District Exhibits at Country Shows.

How They May be Encouraged.

C. C. CRANE, B.A., **Agricultural Bureau Organiser.**

The desirability of local district exhibits as a feature of country shows, and the advisability of some encouragement being offered for their promotion was considered in detail at the conference of Agricultural Instructors, held in Sydney in July, and eventually the report of a sub-committee was adopted in the following terms:—

(1) That this conference appreciates the advisability of actively encouraging Agricultural Societies in the matter of providing for local district exhibits in their schedules.

(2) That the Agricultural Bureau provides the best available method of organising such activities, but that competitions should be open equally to other organisations of farmers.

(3) That in the interests of a uniform development of the system the following suggestions be made:—

(*a*) All entries included in a trophy should be certified the bona fide primary or secondary product of a member of the branch or of any member of his household, and actually grown in the district represented by that branch—and not previously exhibited at this show.

(*b*) That societies should allow a definite sum as organising expenses to every such exhibit that aggregates 50 per cent. of the maximum points available.

(*c*) That the same area of space should be allowed to each exhibit, choice of location to be decided by lot.

(*d*) That a scale of points based on the commercial value of the exhibit as products of a given district should be prepared by the Department of Agriculture on application of the show secretary; such scale of points, &c., to be published apart from the schedule so that branches may know details well in advance of exhibits being staged.

(*e*) That pavilion judges should judge the exhibits in such trophy, same to be arranged in sections as far as possible.

(*f*) That judges appointed in the arts section should award points for labelling and display generally.

(*g*) That small cash prizes be awarded for the best exhibits of their kind in the various sections contained in the particular exhibit.

(*h*) That such section prizes may be special prizes donated by branches of the Bureau or by individuals.

(*i*) That judges be supplied with a book clearly stating scale of points.

(*j*) That a trophy be provided, to remain the property of the society, but to be held by the winning branch.

(*k*) That a sufficient cash prize be awarded on the following basis:—With 10 as the maximum number of points, suppose there were five entries, which respectively scored the following points, 9, 8, 7, 6, 4, and that the prize money was £30, No. 5 would be excluded from participation, not having scored 50 per cent. The total points gained by the four branches was 30, and the proportion of the prize received by them would be nine-thirtieths, eight-thirtieths, seven-thirtieths, and six-thirtieths respectively, or £9, £8, £7, and £6.

(*l*) That uniform prize tickets and the Bureau certificate of merit be supplied by the Department of Agriculture.

(*m*) That a children's section in such exhibits should be encouraged.

The above suggestions were endorsed by the Third Annual State Conference of the Agricultural Bureau, held at Hawkesbury Agricultural College in July.

A Seasonable Reminder as to Lucerne.

The value of top-dressing established stands of lucerne with superphosphate is the subject of periodical departmental reminder. The outstanding advantages of such a top-dressing may be summarised as follows:—(1) The green fodder yield is greatly increased; (2) a better-quality product results; (3) the general condition of the stand is built up consequent upon the vigorous growth developed; and (4) the useful life of the stand may be extended, and depleted stands largely restored.

Extensive departmental and private experience indicates early spring as the best time for this treatment, and about 2 cwt. per acre as (generally speaking) the most effective rate of application. A pamphlet on this subject, and literature on lucerne generally, are obtainable free from the Department.

A Handbook on Grasses.

Discussing some aspects of the meat industry at the State Bureau Conference, Mr. A. G. Manning, M.H.R. (Chairman of the Australian Meat Council), emphasised the fact that in the effort to bring the whole of their product to the highest possible standard farmers must look to two things: first, improvement of pastures, and second, conservation of fodder. In relation to dairying also the moral is the same. "To many farmers no distinctions exist between the values of the various grasses." says Mr. E. Bakewell, in "The Grasses and Fodder Plants of New South Wales."

"Plenty of grass" is a phrase applied to any thick coating, whether it be in the nature of innutritious, unpalatable plants, or the reverse. The handbook referred to offers much information of an essential kind. Copies are obtainable from the Department, or from the Government Printer, Phillip-street, Sydney, for 6s. 4d., post free.

Farmers' Experiment Plots.

Sweet Sorghum Trials, 1924–25.

The Upper North Coast.

M. J. E. SQUIRE, H.D.A., Agricultural Instructor.

Trials were conducted during the past season in co-operation with the following farmers:—

W. McAuliffe, Tregeagle, *via* Lismore.
W. McMillan, Casino.
T. Hannah, junr., "Corra Lynn," Lawrence.
W. McBaron, "Riverview," Raleigh.
R. W. Hindmarsh, "Wiaraga," Bellingen.
H. Short, "Warrawee," Dorrigo.

The seasonable conditions were somewhat unfavourable, being hot and dry during early stages of growth, and then there was almost continuous rain as the crop matured.

All varieties were more or less affected with red stain, which eventually became more pronounced on the early maturing varieties.

Rainfall during the growing period.

—	Tregeagle.	Casino.	Lawrence. 1st planting.	Lawrence. 2nd planting.	Raleigh.	Bellingen.	Dorrigo.
1924.	Points.	Points.	Points.	Points.	Points.	Points.	Points.
September	...	...	154	...	...	...	...
October	...	...	235	...	...	217	...
November	449	518	357	...	468	316	358
December	262	190	209	209	699	488	407
1925.							
January	877	582	676	676	584	655	866
February	273	296	...	292	405	63	682
March	556	1,142	...	639	1,096	...	1,465
April	...	102	...	611	321	...	378
Totals	2,467	2,830	1,631	2,427	3,573	1,739	4,156

Tregeagle is situated in what is known as the "big scrub" country. Soil, red volcanic loam. The land (previously cropped with oats) was ploughed and harrowed twice. Planting was carried out 28th October, in drills 2 feet 6 inches apart. Shallow furrows were opened with a plough 4 inches deep, and the seed sown in the bottom of the furrow, with a maize-dropper fitted with a sorghum plate. This furrow method of planting ensures the seed being planted in moist soil, thus securing better and quicker germination than if the seed was planted in dry surface soil. The plots were

scuffled end of November, mid-December, and early January, to destroy weed growth and conserve moisture. Harvesting was carried out 24th March; all plots were remarkably clean and free from weeds.

Casino.—Heavy black volcanic soil; previous crop, maize; land ploughed and worked up into a fine seed-bed. Planting was carried out 30th October, in drills 2 feet 6 inches apart. The plots were scuffled when necessary. Dry conditions were experienced during the early stages of growth; with the change of the season the late-maturing varieties stooled out fairly well. All plots were harvested on 7th April.

Lawrence.—At this farm three plantings were made, to test the varieties suitable for early, mid-season, and late sowing. The first planting was made on 5th September, and the plots were harvested 28th January. The second planting was carried out 2nd December, and harvested 28th April. Owing to the wet conditions the third planting was delayed until 26th February. The continuous rain and cool weather were responsible for poor growth. The soil at this centre was alluvial loam; previous crop, maize; land ploughed in August and harrowed down. For the second planting another ploughing was given in November and harrowed down. For the third planting several ploughings had to be given during the summer to keep down the weed growth. The necessary scuffling was given all plots, which were free from weeds at harvesting.

Raleigh.—Soil, alluvial loam, previously cropped with maize for green feed. Land ploughed in August and September and disc-harrowed just prior to planting. Planting was carried out 21st October, in drills 2 feet 9 inches apart. The plots were scuffled once, further cultivation being impossible owing to wet weather. All plots were harvested 21st April. Sorghum Nos. 61 and 34 lodged badly. Darso made very poor growth.

RESULTS of Variety Trials.

Variety.	Tregeagle.	Casino.	Lawrence. 1st planting.	Lawrence. 2nd planting.	Raleigh.	Bellingen.	Dorrigo.
	t. c. q.	t. c. q.	t. c. q.	t. c. q.	t. c. q.	t. c. q.	t. c. q.
Honey	25 18 3	12 19 1	15 2 2	23 11 2	8 5 0	...	...
Collier	20 17 0	12 1 0	12 2 3	14 15 3	11 11 2	32 12 1	17 1 3
Saccaline	19 9 0	8 9 3	...	...	11 15 3	Poor germination.	15 0 2
White African	18 17 1	...	...	...	...	Very thin stand.	...
Sorghum No 61	18 17 1	10 2 3	...	18 6 2	Lodged ...	29 15 1	...
Sorghum No. 34	18 17 1	...	...	...	" ..	28 13 2	20 0 3
Red Amber	17 1 3	7 15 2	9 12 0	11 15 3	9 18 0	...	22 19 3
Orange	15 1 3	6 16 3	9 12 2	12 0 0	11 11 0	...	22 2 0
Gooseneck	17 4 1	6 16 3	7 12 3	16 14 1	7 1 2	...	15 12 1
Sumac	14 2 0	9 18 0	...	...	...	20 16 2	14 8 3
Darso	17 12 3	6 16 3	...	14 5 0	Failed ...	...	...

Bellingen.—Soil, alluvial loam; previous crop, oats, planted in February, 1924; being a poor crop it was ploughed in and the land left fallow. The land was then disc-harrowed, ploughed, disc-harrowed and harrowed prior to

planting. Planting was done in drills 3 feet apart, on 22nd October. Harvesting was carried out on 11th February. All plots made excellent growth. Sorghum Nos. 61 and 34 showed a tendency to lodge.

Dorrigo.—Soil, red volcanic; previous crop, maize. Land ploughed in August and October, harrowed, and planted 11th November, in drills 2 feet apart. The necessary scuffling was given. Harvesting was carried out 20th April. All plots stooled heavily; the stems were very fine, and averaged about 8 feet in height.

Notes on Varieties.

Honey.—Medium to late maturing; very fine stems, which are inclined to be hard, pithy, and not very sweet.

Collier.—Late maturing; stems fairly thick but soft; very juicy and sweet. Carries a fair amount of flag, bottom leaves remaining green much longer than most other varieties.

Saccaline.—Late maturing; stems medium, juicy and sweet.

White African.—Late maturing; stems thick but soft, juicy and sweet. This variety was not sown in all plots owing to shortage of seed. At Tregeagle it was sown very thinly. Had a heavier rate of seeding been used it probably would have yielded the highest, as it made excellent growth.

Sorghum Nos. 61 *and* 34.—Medium to late maturing; stems medium to fine, juicy and sweet; tendency to lodge.

Red Amber.—Early maturing; stems fine, inclined to be pithy, sweet.

Orange.—Medium maturing; stems medium, juicy, and sweet.

Gooseneck.—Medium to late maturing; stems medium, pithy, sweet.

Sumac.—Early maturing; stems fine, pithy, sweet.

Darso.—Medium maturing; stems short and thick, with an abundance of flag; pithy; has an unpalatable taste, and is not relished by stock.

Manurial trials were also carried out in conjunction with and under the same conditions as the variety trials.

RESULTS of Manurial Trials.

Manure.	Tregeagle.			Casino			Lawrence.			Raleigh.			Bellingen.											
	Saccaline.			Saccaline.			Collier.			Saccaline.			Collier.			Sorghum 61			Sorghum 34			Sumac.		
	t.	c.	q.	t.	c.	q.	t.	c.	q.	t.	c.	q.	t.	c.	q.	t.	c.	q.	t.	c.	q.	t.	c.	q.
Superphosphate ... 140 lb.	25	18	2	13	6	1	17	13	2	14	17	0	38	4	0	27	2	1	32	0	1	22	2	0
*M5, 210 lb.	25	13	3	10	12	1	27	7	1	12	0	2	22	7	3	24	17	0	29	19	0	18	3	2
*M13, 182 lb.	28	5	3	12	2	3	15	19	1	12	0	2	33	2	0	24	9	0	30	12	3	22	6	0
No manure	19	9	0	8	9	3	14	15	3	11	15	3	32	12	1	29	15	1	28	13	2	20	16	2

* M5 mixture consists of two parts superphosphate and one part sulphate of ammonia: M13, ten parts superphosphate and three parts sulphate of potash.

It will be seen from the above trial that practically all plots responded generously to the application of fertiliser.

Sweet sorghums are grown for green fodder and occasionally for silage. On account of their value as fodder they should have the consideration of every mixed farmer, particularly the dairy-farmer, for supplying succulent

feed in late autumn and early winter, a period when practically all summer crops are done, and the winter crops have not made sufficient growth to make up for the deficiency.

A serious drawback is the poisonous effects produced by young plants if fed to stock before the crop has reached the flowering stage. This generally means that a good, secure fence is necessary to protect stock from breaking in during the early stages of growth.

The mature stems, being very sweet, are greedily eaten by stock, and will remain succulent for a considerable period after the leaves have been killed by frost.

Murrumbidgee Irrigation Areas (Yanco Centre).

W. R. WATKINS, H.D.A., Agricultural Instructor.

The following settlers on the area co-operated with the Department in carrying out trials with summer crops for green fodder during the season 1924–25:—

A. Cartmel, Farm 804, Leeton.
J. McCausland, Farm 333, Leeton.
P. C. Moran, Farm 802, Leeton.
R. Farrar, Farm 796, Leeton.

The season commenced with ideal conditions, but during October and November hot dry winds were experienced, which had a detrimental effect on all young crops, and during the latter month over 5 inches of rain fell and so ruined many crops through scalding. Crops planted during October and early November were mostly ruined by the excessive water, but the earlier sown crops had made sufficient growth to withstand the adverse conditions. The summer was wet and cool, and therefore favoured crop growth on the more open and loamy class of soil, while the crops on the clayey soils were stunted and yields low.

The rainfall for seven months was as follows:—October, 120 points; November, 559; December, 91; January, 279; February, 132; March, 124; April, 23—giving a total of 13·28 inches.

The Plots.

Farm 804.—Manurial trials with both sorghum and maize were carried out on this farm, the former with Saccaline on a grey clayey loam, and the latter with Fitzroy on a red clay loam. The maize land was new, ploughed September, watered and ploughed again in October, then disced, watered, and seed drilled in on 2nd November. The rows were 21 inches apart and seed was sown at the rate of 24 lb. per acre. The crop germinated well and made good growth till about 2 feet high, and from then on was slow. Harvesting was carried out on 20th February.

The sorghum land was previously cropped with maize, was ploughed late winter, twice cultivated September, disced November after rain, watered, and seed drilled in on 23rd November. Seed was sown at rate of 14 lb. per acre, and rows were 14 inches apart. Germination was very good, but weeds were prevalent; however, the crop made good growth, except in any depression in the land where water grass predominated. Harvesting was carried out on 24th April.

Farm 333.—The soil was a red sandy loam, previously cropped with potatoes and pumpkins. Winter ploughed and disced, then smoothed and drilled on 16th October, in two rows 7 inches apart, every 35 inches. Land was inclined to be dry in patches at time of sowing, but germination was excellent and the crop made good growth, benefiting from three cultivations that were given. Sorghum No. 34 made rapid early growth but was very poor in latter stages. Collier and Honey both gave excellent results, and promise to be very suitable for the district. Saccaline was very slow growing and looked poor until the latter stages, when it made exceptionally rapid growth. Harvesting was carried out on 5th March.

Farm 802.—The soil was a red loam previously cropped with oats in 1923, then fallowed. Winter ploughed, cultivated, disced, cultivated again, then sown on 27th October. This crop was practically a failure, due to the excessive rain, and was very patchy in the latter stages of growth. No indications as to the growth and suitability of varieties could be obtained from this trial. Harvested on 12th March.

Farm 796.—The soil was a grey clay, and had self-sown oats growing for two years prior to the sorghum. The land was irrigated, then ploughed in September, cultivated and sown on 30th November in drills 14 inches apart, 14 lb. of seed per acre being used. The germination was only fair and the crop made very slow growth, due to the heavy condition of the soil. However, after an irrigation in February it seemed to rcover and made fair growth. Honey showed by far the best in this trial, being more succulent and of better growth than the other varieties. Harvesting was carried out on 24th April.

RESULTS of Variety Trial.

Variety.	Farm 333.				Farm 802.				Farm 796.			
	t	c.	q.	lb.	t.	c.	q.	lb.	t.	c.	q.	lb.
Collier	36	0	1	7	7	4	0	4	14	16	3	0
Sorghum No. 34	16	4	0	12	...	...	...	...	...	...	...	...
Honey	34	0	2	13	...	...	...	...	18	12	0	6
Orange	21	1	1	7	7	6	1	20	...	...	...	...
Saccaline	27	4	2	0	...	...	...	...	14	13	3	12
Sorghum No. 61	...	...	...	...	5	6	2	10	12	11	0	15

Superphosphate at the rate of 70 lb. per acre was used throughout the above trials.

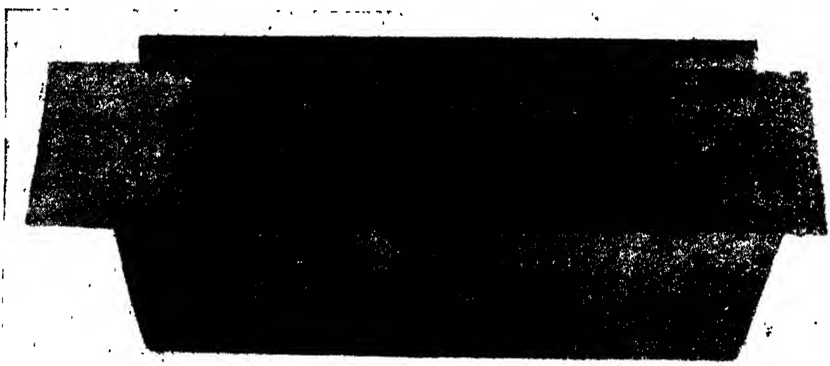
RESULTS of Manurial Trial.

	Fitzroy Maize.				Saccaline Sorghum.			
	t.	c.	q.	lb.	t.	c.	q.	lb.
Superphosphate, 140 lb. per acre	19	5	0	15	26	15	1	10
M13 at 182 lb. per acre	18	8	3	20	23	4	2	10
M5 at 210 lb. per acre	17	12	2	25	25	9	5	13

M13 consists of 10 parts of superphosphate and 3 parts sulphate of potash. M5 consists of 2 parts of superphosphate and 1 part sulphate of ammonia.

HOW QUEEN BEES TRAVEL.

THERE is nothing especially regal looking, perhaps, about the travelling quarters pictured herewith, but the illustration will nevertheless be of interest to those unfamiliar with the method by which queen bees are despatched, especially for shipping long distances. The cage is so designed as to offer the royal traveller and her attendants all that is necessary for their well-being during the journey. That shown is the one in which queen bees were recently imported by the Department from Carniola, in Austria, though in this case, unfortunately, the bees failed to survive the trip.



Queen Bee's Travelling Cage.
Intended for long distance journeys.

In the centre compartment (where the comb is seen) the queen and her attendants are housed. The small compartments to the right and left contain candy necessary for their nourishment, to which access is provided by small apertures. The object of placing the small frame with comb in the centre compartment is to induce the bees to cluster there under somewhat natural conditions. This shipping cage is larger and more complete than the ordinary mailing cage used in the local trade, provision having to be made for the additional number of attendants, a larger food supply, and more natural conditions for the bees, covering a longer cage period under the hardships of shipping and varied climatic conditions experienced en route.—W. A. GOODACRE, Senior Apiary Instructor.

A Radius System of Inspecting Holdings for Rabbit Destruction.

FRANK FORSTER, Inspector of Stock, Goulburn.

FROM fifteen years' experience as an inspector, during which time I have been in charge of four separate districts and have observed the management of several others, I am convinced that considerable improvement is possible on the present practice of working under the Act.

I put the following views before the Goulburn Board and it was unanimously agreed that my scheme was worth a trial and I was instructed to put it to the test at once:—

> "At present the work is chiefly carried on by following up reports received, or investigating complaints lodged and by patrolling here, there, and everywhere, and dealing with cases in a more or less haphazard way without special regard to the condition of the immediate neighbourhood. Results are slow and imperfect. Irritation is caused among owners dealt with, who claim that their neighbours who are little or no cleaner escape an inspector's eye, or are left by him until later owing to calls elsewhere. The man who has cleaned his place up is constantly in trouble, and under expense through invasions of rabbits from some careless owner joining him, and fails to comprehend why so-and-so in some remote part of a district is fined, and the offender next him is not compelled to eradicate the pest.
>
> "I am of opinion it would be an improvement for a P. P. Board to select as centres, say, twenty or more properties scattered throughout the district known to be free of rabbits and rabbit harbour, and sure of being maintained in that condition, and to concentrate on the lands surrounding each. In this manner and radiating out from these fixed centres, a wider and wider area of clean country could be secured until one zone ran into another and whole localities of good country were freed of the pest.
>
> "My claim for this plan is that it introduces method into the work, is quite simple to understand, and helps the owner who has done his part thoroughly. No surprises would be sprung on anybody, for the progress of the work could be watched by everyone, and each would know quite well when his turn came to finally clean up. Friction would be eliminated as it would be perfectly fair to insist on a landowner doing what he could see for himself his neighbour had already done. Furthermore, it would free an inspector from any suggestion of picking people out for prosecution and substitute reason for apparent arbitrary action by Boards."

In a number of districts, Goulburn being one of them, the rabbits are fairly well suppressed, but with the exception of certain carefully controlled holdings which my system would take as centres, the pest is still about, and any change in policy of dealing with it or severely adverse weather conditions would make it as bad as ever in three months time. The Act has been in operation against rabbits for many years now, yet the holder of land well cleaned up still has to employ one to three or four men doing little else but riding fences and keeping out other people's strays. What I propose is simply following the scientific principle adopted in freeing malaria-infected lands of mosquitoes, and the method of clearing "zones" of the cattle tick country in America. Furthermore, not an extra sixpence is required to put this system into operation. The Boards of the State now have their inspectors and the legal machinery.

When unoccupied Crown lands are met with within the radius of any centre, as will occur in a district like Goulburn, I expect by being able to show a solid progressive plan of working to get some assistance from Government; at present it would be futile to ask for this, as no guarantee could be given that such lands would not at once become re-infested. In any case, these lands are of the poorest class and do not breed two rabbits to every hundred found on neglected improved country.

By keeping a map of the P. P. District (ordinary county maps pasted together), and hatching in the clean centres with red ink and progressing as these widen out, the position could be observed at any moment and, I venture the opinion, would show the Central and Eastern Divisions of the State and some of the Western Division freed from rabbits within the next five years.

The True Worth of Pure-bred Pigs.

The great value of pure-bred stock is that it breeds comparatively true to type. A first cross is often a superior individual, but it fails to transmit its excellence to its offspring. Prepotency or marked tendency to impress individual or breed characteristics on offspring is a quality possessed by pure breeds. When purchasing a boar, always give preference to one in whose family fertility is a pronounced feature.

When close line breeding or inbreeding is strictly adhered to, the strain becomes remarkably uniform, but in some cases uniformity has been obtained at the cost of constitution and prolificacy. If two strains which differ in their blood lines are crossed, the result is generally larger litters, and youngsters that possess a stronger and more vigorous constitution.

The progeny of a cross-mating between two pure breeds can be expected to be very uniform in type, but if these crossbred pigs are used for breeding, the next generation will consist of very mixed types. Breeding from crossbred pigs is therefore to be discouraged.—Dr. G. F. Finlay, late Director of the Animal Breeding Research Department, Edinburgh University.

Grasshopper Swarms and their Control.

W. B. GURNEY, B.Sc., F.E.S., Government Entomologist.

THE grass-hopper which appears at intervals in destructive swarms throughout various districts of the State is a small brown species about 1½ inches long, known as *Chortoicetes terminifera.* This species occurs also in swarms in Queensland, Victoria, South Australia and West Australia, and is therefore widespread. Occasionally another species, *C. pusilla,* has appeared in swarms, and in the Hunter River Valley *Oedaleus senegalensis* also appeared one season in large swarms. In Queensland a coastal species, *Cyrtacanthacris exacta,* found also in eastern New South Wales, appears occasionally in swarms, and does some harm to the sugar cane fields. However, we may confine our attention to the small brown species (*C. terminifera*) first mentioned above, which is the only one of serious import in this State.

Occurrence of the Swarms.

Fortunately this species only appears at intervals approximating five years, though, of course, it is present every year in limited numbers. Thus, destructive swarms were recorded for the summer seasons 1907-8, 1917 to 1919, and now in 1924-5, with perhaps some local minor appearances at other times.

Dry conditions apparently favour the development of grasshoppers, and following several dry seasons the grasshoppers may increase sufficiently to appear in swarms; conversely, wet seasons seem adverse to the increase of grasshoppers. Any decrease in native insectivorous birds would aid the natural increase of the hopper, birds being persistent factors in reducing the swarms, especially in the hopper stages Ibis, wood-swallows, starlings, bustards, and even magpies and crows feed on the swarms of hoppers. The influence of internal and external parasites, and predators of eggs and of the grasshoppers themselves, is often overlooked as a factor in control.

The factors essential to the decrease of grasshoppers swarms, therefore, are wet seasons, the prevalence of insectivorous birds, and various small wasp parasites of eggs, certain predatory beetles and mites, and several species of parasitic flies which live within the bodies of the grasshoppers, The above factors are sufficient to account for the rise and fall in the number of grasshoppers, and the appearance of swarms for a season or two, followed by their almost sudden reduction to a few scattered individuals during even longer periods.

Number of Broods.

Two main broods are noticeable throughout the year. The over-wintering eggs in the ground hatch during late August and through September and October. These young hoppers grow gradually and become winged (according to the date they hatch) from late November through till January. The eggs of these winged forms produce the second brood of hoppers, which may be in evidence throughout December until March. By April and

May the second brood of winged hoppers has appeared, and these lay their eggs in the soil, where they over-winter until about the following September. It will be seen that there are two main broods, but the dates of their appearance are irregular owing to different dates of hatching, and also to the fact that the adult winged grasshoppers lay several batches of eggs, with the result that both hopper and winged stages may overlap even in the same district.

The Habits of the Grasshoppers.

Both hoppers and winged forms feed wholly on grass, weeds, crops, and other vegetation. The winged forms fortunately possess the habit of congregating and settling on comparatively limited areas for the purpose of laying their eggs. The swarm generally selects somewhat bare, scalded patches on gently rising land when congregating to lay their eggs. These egg-beds may, therefore, be patches of land of a few hundred square yards up to many acres in extent. The winged swarms may fly for miles, and there is a tendency for swarms to avoid timbered land when settling to

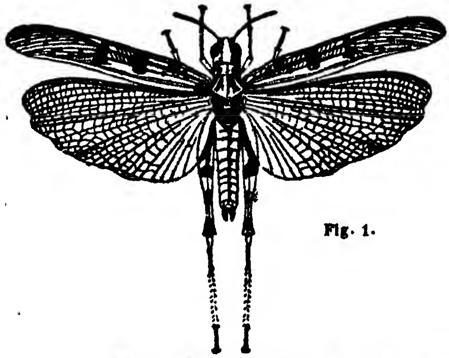


Fig. 1.

Fig. 2.

Fig. 3.

Fig. 1.—Plague Locust (*Chortoicetes terminifera*).
Fig. 2.—Youngest stage of "hopper" when spraying is most effective.
Fig. 3.—Late stage of "hopper," with wing pads well developed.

feed. The young hoppers on hatching spread outwards from the egg-beds, feeding on the grass and moving forward in long lines of thousands of tiny wingless hoppers. These increase in size, and by a series of moults gradually attain to the adult winged stage. The male and female forms copulate, and when the female is ready to lay her eggs she settles on the ground and inserts the hind part of her body in the soil by working two pairs of short hard ovipositor blades at the extremity of the abdomen. Even the hard soil of scalded patches, roadways, and beaten tracks may be penetrated and the eggs deposited at depths of from 1 inch to 3½ inches. The abdomen of the female is abnormally extended to enable it to deposit the eggs so deep in the soil. A frothy liquid secretion is exuded along with the eggs, which hardens into an irregular sheath of a tough spongy nature, and considerably protects the eggs from predaceous insects and from the effects of moisture.

An average of thirty-six eggs is laid by the female in each hole, and each female may lay more than one cluster of eggs. A very great number of egg holes are constructed side by side in the soil when the swarms

cluster together for egg laying. Counts made of the number of egg holes per square foot reveal from 200 to 800, with an average of about 300 per square foot over several acres, while the number of eggs laid per acre runs into many millions. At a conservative estimate, therefore, there may be 10,000 eggs per square foot in these areas, or over 400 million eggs per acre. This emphasises the great advantage of locating these egg-beds, and of spraying and destroying the young hoppers immediately they hatch and before they spread.

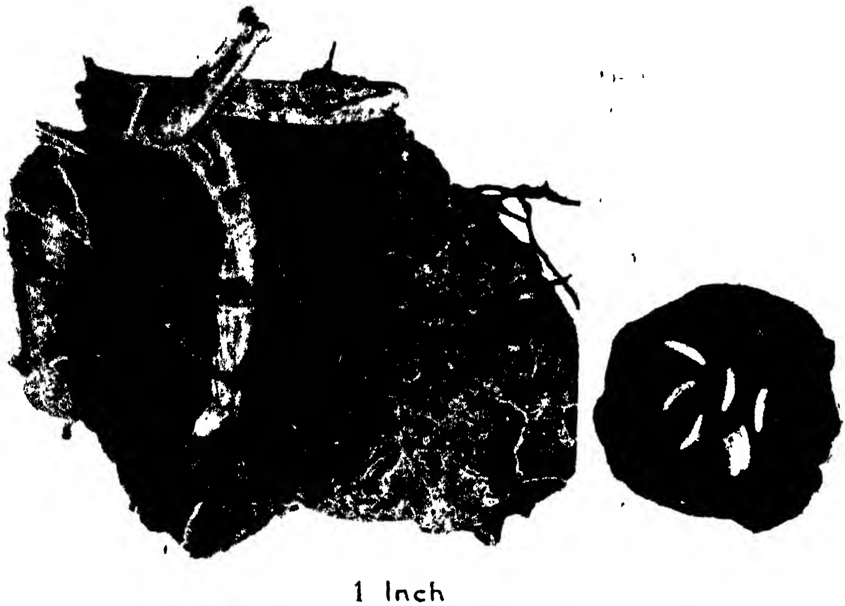


Fig. 4.—Left.—Transverse Section of Female Hopper Ovipositing.
This female, being "caught in the act," was promptly killed, and the soil carefully opened to disclose the extended ovipositor.
Right.—Eggs of Grasshopper in the Soil.

Life History.

Briefly recapitulated, the life stages may be presented thus:—

Over-wintering egg stage—5 months, hatching about September.
First hopper swarms—September to November.
First winged swarms—December to February.
Midsummer egg-laying—December to February.
Second hopper swarms—January to March.
Second winged swarms—March to May.
Autumn egg-laying—March to May.

Due allowance must be made for variations in climatic and local conditions.

Control Methods.

On Grass Lands.—The best control is to be obtained by spraying the swarms of the young hoppers during the first three weeks after they hatch from the beds, and before they have spread far and scattered, which they do as they grow older.

An important factor in the scheme of control is to mark the egg-beds, which, as stated, are limited patches from a few hundred square yards up to 50 or more acres, according to the size of the swarms. Having marked the egg-beds, or noted in the spring where the young hoppers are hatching, organised working parties should spray the patches within the first three weeks after emergence. The effect is to kill the young hoppers before they have done any appreciable damage. If this was universally carried out, the pest could be controlled in the spring before a second and larger swarm of hoppers could be produced in the midsummer. Labour, time and material can all be saved by spraying early in the spring, as the subsequent swarms will then be almost negligible.

We have demonstrated over a number of years now the complete efficacy of arsenite of soda spray as a control for grasshoppers in the hopper stages on pasture land. The formula recommended is 1 lb. arsenite of soda (pre-

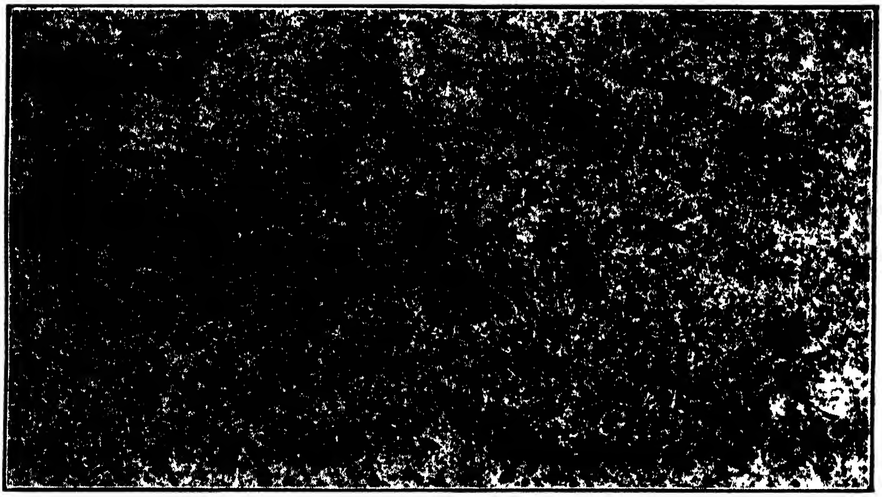


Fig. 5.—Swarm of Female Winged Hoppers, Settled for Egg-laying.

ferably 75 per cent. arsenious acid content), 4 lb. of treacle or molasses (preferably treacle), and 16 gallons of water. Even without treacle or molasses, this spray is valuable for control.

Dissolve the arsenite of soda in some hot water in one vessel, and the molasses also in warm water in another vessel. Allow the two solutions to almost cool before mixing them together and diluting to the correct strength.

The spray should first be applied on a strip of grass for about 30 feet in front of the advancing hopper swarms, and then directly on to the swarms. The spray kills partly by caustic action, but mainly because the hoppers drink the liquid or feed on the poisoned grass. About 75 to 80 gallons of spray per acre is quite sufficient, and it is not advisable to waste material

by drenching the grass, but merely to apply it in a fine mist. The cost for material at Denham worked out at about 12s. per acre.

It has been proved by severe tests that the spray, made and applied as directed, is not harmful to sheep.

During last season experiments were carried out at Narromine with calcium cyanide dust for the control of grasshoppers. It was found that where the dust was applied directly on to a swarm of hoppers, so that it dusted their bodies, it killed very thoroughly. It was necessary, however, actually to hit the 'hoppers with the dust, and it did not kill them when they were driven over dust which had been applied to grass or ground. However, there was evidence to show that a strip of ground dusted with calcium cyanide deflected hopper swarms, and it might therefore be used to turn swarms away from cultivation paddocks. It was found that at least 5 lb. of pure calcium cyanide dust must be applied per square chain to kill the hoppers with direct application. This means 50 lb. of calcium cyanide is needed per acre, which at 8s. per 5-lb. tin works out at £4 per

Fig. 6.—Swarm of Winged Hoppers Disturbed.

acre. It was thought too expensive, therefore, for large scale operations where water and arsenite of soda could be used, or even where poisoned baits could safely be employed. Where water is extremely scarce and needs to be conveyed long distances, or where a quick kill of advancing hoppers is needed to protect cultivation paddocks or orchards, calcium cyanide could be used.

The calcium cyanide was also tested, diluted half and half with an inert substance (talc powder), but was found at this dilution to kill not more than 50 per cent. when applied directly on to the young hoppers. A knapsack duster was employed in all these experiments.

In cultivation paddocks use bran and arsenite of soda or else bran and paris green baits sweetened with molasses. This poisoned bran, made into a crumbly mash, is sown broadcast in a crop over a strip 30 or 50 feet wide in front of any swarm which has entered the crop, or along the edge of the crop if the swarm is just entering. Experiments carried out last season at Leadville and Coolah Valley showed that bran and paris green gave excellent results, but it was found that white arsenic with soda to form

arsenite of soda gave a quicker kill. White arsenic alone was less effective than paris green. The following formula, therefore, can be recommended:—

1 lb. arsenite of soda, or paris green;
1 lb. molasses, or treacle;
24 lb. bran.

With a shovel, mix very thoroughly the paris green and bran while dry. Dissolve the molasses in water sufficient to make the bran into a crumbly mash. This can be rapidly broadcasted by hand from sacks carried across the shoulder, 5 to 20 lb. of the mixture being scattered per acre, according to the size of the swarm. The hoppers are attracted to this bait even in crops, and are poisoned in large numbers within twenty to forty hours. Stock must not be permitted where these baits are employed.

In America sawdust or horse manure have been employed in place of the bran, and have been found fairly attractive, and cheaper. Some experiments abroad have also shown that oranges (about five to each 24 lb. of bait) if chopped up and added, make the bait more attractive.

Scheme of Control Operations.

The success of arsenite of soda spray for pasture land and of poison bran mash for cultivation paddocks having been demonstrated, it is obvious that all that is required is universal action throughout each district.

The problem is a community one, and should be taken up as such. The best results can only be obtained when every landowner is on the lookout and is prepared to aid in combating the pest. Preparations should be made before the first spring hatching of the hoppers. A sufficient stock of arsenite of soda, treacle, and bran, and an equipment of spray pumps, fire carts, &c., should be purchased and stocked in each district. Local committees should be elected to employ labour and organise co-operative campaigns to control the swarms. It is incumbent that all districts where grasshopper swarms occur should be prepared, and should undertake this co-operative work, so that adjacent districts carrying out control work shall not be re-infested by flying swarms from districts that have neglected to adopt control methods. The expense is limited to treatment of the initial swarms, and the outlay is only likely to occur in any district once in five years or more. With control measures universally adopted the grasshoppers should not be able to appear in destructive numbers in any part of the State. A nominal levy once in five years or so of a fraction of one penny per acre or based upon the stock held would provide all the funds necessary. There is no reason why powers should not be conferred upon Pasture Protection Boards in this direction.

All such grasshopper control committees should insist on landowners giving notice of the presence of egg-beds or winged swarms, and also of the first appearance of any batches of young hoppers hatching from the ground. This will enable prompt action in spraying and the destruction of the swarms before they can assume dangerous proportions.

If grasshopper committees would notify the Under Secretary for Agriculture promptly on the appearance of young hoppers, the Entomological Branch would be glad to aid and direct control operations if desired.

Clovers and Lucerne in Pastures.

THE VALUE OF CLOVERS IN CROP ROTATION.

J. N. WHITTET, H.D.A., Agrostologist.

THE need for leguminous plants in pastures has long been recognised, and greater interest is now being taken by pastoralists as well as farmers, in this phase of pasture improvement.

More leguminous crops should be included in the system of crop rotation, as they add humus to the soil and increase its value for cropping by the fixation of atmospheric nitrogen. Some species of clovers are admirably adapted to this purpose.

The following recommendations are made as a result of trials conducted in many parts of the State during recent years.

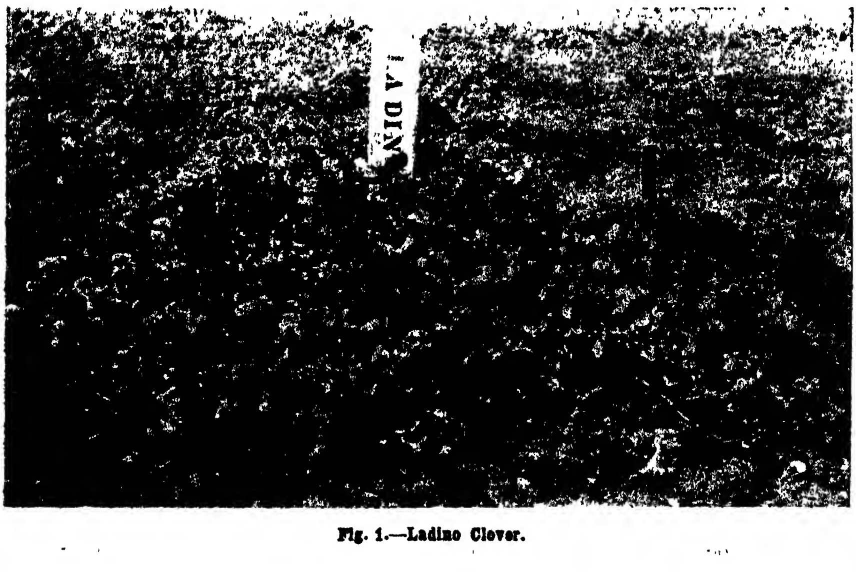


Fig. 1.—Ladino Clover.

Coastal Districts.

The best species to use in pastures are undoubtedly White clover (*Trifolium repens*), and any of the perennial forms of Red clover (*Trifolium pratense* var. *perenne*), such as Cow grass, Perennial Red or Chilian.

Fortunately, we possess in White clover a perennial plant that will strive amongst such strong growing grasses as paspalum and couch. As White clover provides excellent feed during winter months when these two grasses are dormant, this feature considerably enhances its value to the dairy farmer.

Large areas are now being planted with Perennial Red and Cow grass clovers for grazing purposes; they are also being plentifully used in pasture mixtures. These species provide a greater bulk of feed than White, but are not quite as permanent or as persistent in paspalum areas.

We are finding these red clovers growing in native pastures, seed having been spread by stock per medium of their droppings.

Ladino (*Trifolium repens* var.), a strong growing form of White clover, is giving good results in coastal districts. It has larger leaves and stronger growing runners, and provides a large quantity of feed.

The strains of English Wild White clover (*Trifolium repens* var.) have been tried, but in no case have they given as good results as our ordinary White or Ladino, as they only produce a small quantity of feed in comparison with the growth made by the varieties named.

Fig. 2.—A Paddock of Shearman's Clover on Mr. J. H. Shearman's farm at Fullerton Cove.

Alsike clover (*Trifolium hybridum*), does better than White in somewhat damp situations, but is not as valuable as Strawberry clover for very wet conditions.

Subterranean clover (*Trifolium subterraneum*), an annual, is proving particularly useful on undulating country, as it helps to hold the soil together, especially on hilly slopes. It is a valuable plant for sowing in bracken fern, as it tends to choke that pest out.

Where rapid growing annuals are required in the rotation, Berseem (*Trifolium Alexandrinum*) and Crimson (*Trifolium incarnatum*) give best results. If the material is to be used for green fodder and the residue ploughed under, Berseem is preferred to Crimson owing to the latter's hairyness.

The sowing of seed of Strawberry clover (*Trifolium fragiferum*), or planting of roots of Shearman's clover (*Trifolium fragiferum* var.) should be carried out in damp spots. The former is likely to spread more rapidly

Fig. 3.—Crimson Clover (*Trifolium incarnatum*).

Fig. 4.—Bokhara Clover (*Melilotus alba*), Glen Innes Experiment Farm.

than Shearman's, owing to it forming a fairly large quantity of seed. We occasionally find a few seeds in Shearman's clover, but a large number of heads have to be examined before seed is obtained.

Northern Tableland.

On the better class land, the Perennial Red strains give best results in pastures and rotation. A common practice is to include 8 to 10 lb. of seed with the last cereal crop to be sown, the area being turned over to pasture after the hay or grain crop is removed.

In some localities there appears to be a use for Biennial Bokhara (*Melilotus alba*), especially on the heavier type of soils, and those too wet for the production of lucerne as a grazing proposition.

It is essential that the seed of Bokhara clover be scarified with sandpaper before being planted, otherwise an unsatisfactory stand will result. The following tests recently carried out in our seed laboratory strikingly illustrate the value of this treatment.

The seed can be treated by rubbing between two boards to which sandpaper is tacked, or spread in a thin layer on a concrete floor and rubbed. After the hulls are removed continue the operation until the outer seed coat is well scratched, but the seed not broken.

TREATED *v.* UNTREATED SEED.

Hulled and scarified, 81 per cent. germination.
Unhulled and scarified, 54 per cent germination.
Unhulled and unscarified, 10 per cent. germination.

The extra amount of rubbing required to remove the hulls had a beneficial effect.

This clover is proving useful as a rotation crop with maize and potatoes in the Tenterfield district.

Owing to the fact that Bokhara clover is liable to cause taint in milk and flour, its propagation is likely to be restricted to localities where dairying or wheaten grain production is not carried on.

Southern Tableland.

Strains of Perennial Red and Subterranean are being used, the latter proving very suitable for working in amongst the poor quality native grasses on the rougher type of country. (See *Agricultural Gazette*, February, 1925, Fig. 31, facing page 114.)

Sowing 2 lb. of seed with the last cereal crop is an excellent method of rapidly establishing Subterranean clover on worn out cultivation land. In order to obtain the best results from this clover, it is essential to use ¾ to 1 cwt. of superphosphate as a top-dressing in May or June. (See Fig. 9.) This not only produces excellent leaf and stem growth, but ensures the formation of an abundance of seed, which is essential in the case of any annual pasture plant.

In parts of this locality top-dressed areas of Subterranean clover are completely choking out Sorrel (*Rumex acetosella*) and Black thistle (*Carduus lanceolatus*).

Central Tableland.

The recommendations made for Subterranean clover in Southern Tableland districts also apply to this locality.

The strains of Perennial Red clover give satisfactory results on good cultivation land, but are not as hardy or as prolific as lucerne, especially during winter months.

Irrigation Areas.

The best clover to include in the rotation is Berseem, sowings to be made in April. The rapid growth made by this species, especially during winter months, makes it a useful crop for the mixed farmer to plant.

In soils too heavy for the cultivation of lucerne, Subterranean clover for pasture purposes should be sown in the autumn.

Riverina.

On old cultivation land (such as average wheat country) lucerne gives exceptionally good results, providing good pasturage for seven or eight years. A mixture of lucerne, 2 lb., and Wimmera Rye, 4 lb., per acre, sown with the last grain crop to be grown, provides excellent pasturage free of detrimental plants, especially during the months when Spear and Barley grass seeds are very prevalent. (See Fig. 7.)

On shallow soils and hilly country Subterranean clover is providing good grazing for both sheep and cattle.

Western Slopes.

On land unsuitable for the production of grazing lucerne, such as creek flats which crack badly and expose the lucerne roots to sun and wind, Subterranean clover is proving of great value. Where the soil is fairly friable 1 to 2 lb. of seed per acre (*a*) worked in amongst the native grasses, (*b*) planted with the last cereal crop to be grown, or (*c*) drilled in on cultivated stubble land, which is to be thrown out of cropping for some years, all give good results.

In parts of the Central-western district, top-dressed Subterranean clover is efficiently choking out weeds such as Cockspur thistle (*Centaurea melitensis*), Black thistle (*Carduus lanceolatus*), Cape weed (*Cryptostemma calendulaceum*), Sorrel (*Rumex acetosella*), and other weeds whose periods of growth coincide with that of the clover.

Lucerne.

One of the most valuable legumes to sow in pastures from the point of view of drought resistance, permanence, and all round grazing value, is lucerne.

From the coast to the west we are using lucerne in pasture mixtures, as well as sowing it alone for grazing purposes and hay. Its adaptability to all climatic conditions, varying from the extreme cold of New England and Southern Tablelands to the heat and restricted rainfall of the Western Slopes, places it in the front rank of our most valuable fodder plants.

Not only does it provide succulent feed at all seasons in average years, but, once established, will supply good picking in droughty periods. Its use, when sown alone for grazing purposes or in a pasture mixture, is rapidly becoming recognised, and it is safe to predict that in the future larger areas will be sown each succeeding year.

The best varieties of lucerne to sow in any part of the State where lucerne is to be grown are our local strains, which are generally sold by seedsmen and growers under the names of the districts in which they are produced, such as Hunter River, Tamworth, Mudgee, Canowindra, etc. We have grown all the world's most drought and frost resistant types, such as Grimm, Montana, Oskosh, Semipalatinsk, Cossack, Ontario Variegated, Siberian, etc., but our local strains give better results than the imported material, even in the colder and drier parts of the State.

Clovers and Medics in Native Grass Areas.

In all localities where the clovers and medics occur, which, together with other plants, make up the feed generally spoken of as herbage, they will greatly benefit by a top-dressing of ½ cwt. superphosphate per acre, applied in April or May.

In the drier parts of the State, plants such as Ball or Clustered clover (*Trifolium glomeratum*), Hop clover (*T. procumbens*), Woolly clover (*T. tomentosum*), Haresfoot trefoil (*T. arvense*), Burr clover (*Medicago denticulata*) and Wolly burr trefoil (*M. minima*), readily respond to top-dressing, and, not only make increased growth, but also seed profusely, a factor of the utmost importance in the case of annual plants growing in areas of restricted rainfall.

Special Features.

Subterranean clover should be sown as early as possible in the autumn, and top-dressed later on with superphosphate, to give best results. Being an annual it must be allowed to form seed in November or December, otherwise it will be considerably thinned out of the pasture.

Under ordinary conditions of stocking, however, runners of Subterranean clover set sufficient seed under the soil to maintain it in a pasture for all time.

On areas where only 1 to 2 lb. of seed has been sown per acre, stock should be kept off Subterranean clover during its first year's growth, until the runners are well grown and seed has set. The intervening spaces between the plants are then quickly covered. If stock are put on before the runners are well established many plants will be pulled up and destroyed.

Where lucerne will thrive it is preferred to Subterranean clover, being of a more permanent and drought resistant character, and providing feed during all periods of the year. Lucerne will not develop in heavy clays, or in soils with impervious subsoils, as the development of a deep rooting system is prevented, and the surface soil is likely to become waterlogged. On alluvial flats which crack badly, soils too shallow to allow of a deep

Fig. 5.— A 5-year-old Stand of Grazing Lucerne at Trangie.

Fig. 6.—Subterranean Clover among Thistles at Parkes.

Fig. 7.— Lucerne and Wimmera Rye among Wheat Stubble.

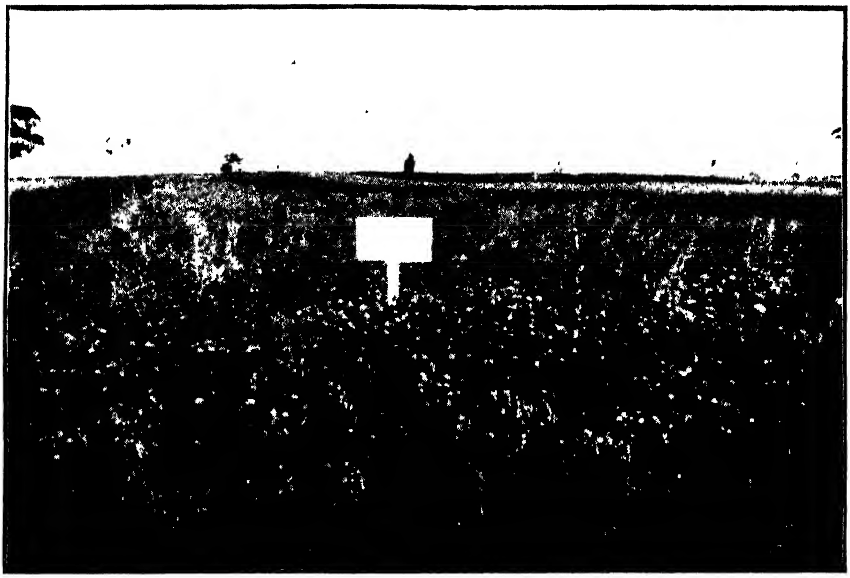


Fig. 8.—Perennial Red Clover after Oats at Glen Innes.

Fig. 9.—Subterranean Clover in Crookwell District.
On the left, unmanured ; on the right, top-dressed with superphosphate at the rate of 140 lb. per acre.

rooting system being developed, country too rough for cultivation to be carried out, and for working in amongst established pastures, Subterranean clover is exceptionally valuable.

In warm districts, plant Strawberry clover on wet lands. It will not give satisfactory results unless plenty of moisture is present, or if the locality is very cold.

All rapid-growing clovers readily respond to top-dressing with superphosphate. In the drier parts of the State use ½ cwt. per acre, but in localities where the rainfall is good increase the amount to 1 cwt.

Where clovers and lucerne are planted along with grasses, the risk of hoven or bloat occurring is reduced, on account of the mixture of feed present.

Time and Methods of Sowing.

Clover and lucerne seed should only be lightly covered. When planting with a cereal crop, sow clover seed through the grass seed attachment of the wheat drill, and allow seed to broadcast in front of the hoes or discs, or mix the clover seed with superphosphate and sow through the fertiliser box, setting the hoes or discs so as to place the seed just under the surface of the ground. When broadcasted, a cultivator or harrow should be used to work the seed in. On light open soil, roll the seed into the ground, and then follow with a light harrow to create a mulch.

Where it is impossible to use implements for sowing and covering, the seed should be broadcasted in and around stump holes, dug out rabbit burrows, among fallen timber, in the ashes produced by a good burn, or any other suitable cover in which it will be held and later germinated.

In cold or dry localities all clover seed should be sown in the autumn; in Northern Tableland districts sow Bokkara clover in the spring. Where extremely cold conditions are experienced, lucerne should be sown in the spring, otherwise an autumn sowing is recommended.

In coastal districts the sowing period of the perennial clovers may be extended until the end of June, if the autumn is too dry to obtain a good germination.

Quantities of Seed to Sow per Acre.

The quantities of seed to be sown for different purposes may best be presented in the following tabular form:—

	Alone.	In Pasture Mixture.
Perennial Red strains	10 lb.	2 lb.
White strains	6 to 8 lb.	2 lb.
Berseem	10 to 12 lb.	Not recommended.
Crimson	10 to 12 lb.	,, ,,
Subterranean	2 to 4 lb.	1 lb
Alsike	6 to 8 lb.	2 lb.
Biennial Bokhara	10 to 12 lb.	2 lb.
Strawberry	......	On account of the high cost of seed use 1 lb. per acre, scattering a few seeds here and there in damp spots, where it will spread rapidly.
Lucerne (for hay and green feed)	15 to 20 lb.	....
,, (for grazing purposes)...	4 to 6 lb.	On average wheat land in dry localities 1 to 2 lb.

The Inheritance of Fecundity in Fowls.

E. A. SOUTHEE, Principal, Hawkesbury Agricultural College *

DURING the last twenty-five years or so poultry has formed in no small way a favourite subject for breeding experiments, particularly by geneticists, *i.e.*, those who are attempting to explain "the resemblances and differences which are exhibited among organisms related by descent." These experiments, while of great scientific value, have not very often had any particular value as an aid to elucidating the practical problems of the poultry-farmer.

One outstanding problem, of interest alike to the research worker and the practical poultry-farmer, is that relating to the inheritance of egg-production, and particularly to high egg-production. This problem has occupied the attention of many workers, particularly in the United States, and considerable light has been thrown on the problem, leading to various explanations of the manner in which high egg-laying capacity is transmitted from one generation to another. The question is being investigated, so far as I can gather, in at least ten different States there, and here in our own small way an attempt is being made to investigate this same problem.

It is not possible here to discuss the scientific basis of the various explanations put forward to account for the inheritance of fecundity in fowls. Suffice it to say that since the rediscovery for the world some twenty-five years ago of what has come to be known as Mendelism, there has been developed a series of conceptions regarding heredity, which have, in addition to the other accepted facts of Mendelism, formed the bases for the work of the various investigators of the problem of fecundity.

Poultry breeders have, whenever possible I suppose, chosen hens with high pullet records for mating with males whose dams had high records with the object of increasing the average production of the flock. Dr. Pearl, of the Maine (U.S.A.) Agricultural Experiment Station, which has been foremost in its work on egg-production, showed that this is not the solution. After following this system of mass selection very carefully for nine years, no increase in the average production of the flock was brought about. The method was then changed, and hens were chosen not only for their ability to lay a large number of eggs, but also for their ability to produce daughters of high egg-laying capacity, while the males were chosen after the egg-records of their daughters were known. Following the application of this method a rapid increase in average production took place. Selection was also carried out on analogous lines to obtain a poor-laying strain. The results obtained are illustrated in the accompanying chart (page 650).

Thus were established the facts that (1) fecundity is inherited; (2) the record of fecundity of a hen, by itself, gives no reliable information of the egg-production of her daughters.

* Paper read at Poultry Conference, Hawkesbury Agricultural College, June, 1925.

From his studies Pearl had concluded that winter egg-production was a satisfactory criterion of annual egg-laying, and also that in so far as winter egg-production was concerned, birds fell into three defined classes—(*a*) those with high winter records (above 30); (*b*) those with low winter records; (*c*) those laying no eggs at all in the winter period. Using these premises as a basis, he carried out a very extensive series of matings, and by submitting the results to a detailed analysis, drew the conclusion that (1) high fecundity may be inherited by daughters from the sire independent of the dam; (2) high fecundity is not directly inherited by daughters from their dams; (3) low fecundity may be inherited by the daughters from either sire or dam.

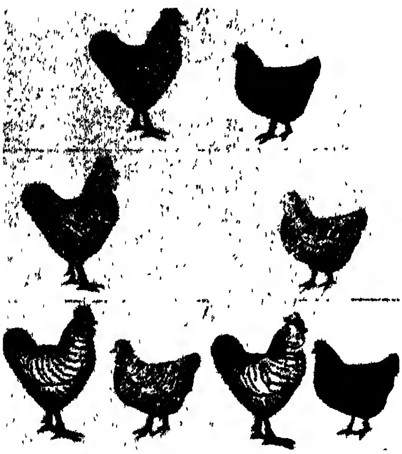


Fig. 1.—Cross between Barred Plymouth Rock male and Black Langshan female.

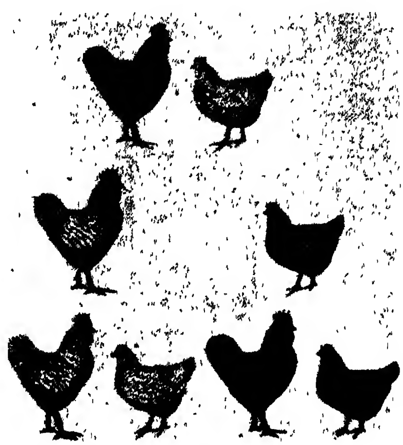


Fig. 2.—Cross between Black Langshan male and Barred Plymouth Rock female.

[*After Morgan*

He postulated three distinct and separately inherited factors to account for fecundity of the female fowl—an anatomical factor F, and two physiological factors L_1 which, with F, brings about a winter record under 30 eggs, and L_2, which with F and L_1 leads to a high degree of fecundity. L_1 and L_2 must be present together to cause high fecundity.

The second physiological factor, L_2, he found to be sex-linked. It is therefore transmitted in a manner similar to the case of colour-blindness in human beings and tortoise-shell colour in cats, where these characters are more common in males than in females. In fowls, sex-linkage might be illustrated in the case of a cross between a Barred Plymouth Rock and a Black Langshan (see figure). When a *barred* male is crossed with a *black* female, all the progeny are *barred*. If males and females of this latter *barred* type be mated, the progeny consists of *barred* and *black* in the proportion of three barred to one black; the black is always female, while two of the barred are males and the other female.

When, however, the reciprocal cross (Black Langshan male with Barred Plymouth Rock female) is made an altogether different result takes place. The progeny now consists of equal numbers of *barred* and *black* types, and, further, all the barred type are males, while all the blacks are females. If these latter barred males and black females be mated together the progeny consists of equal numbers of barred males, barred females, black males and black females. By substituting " high-laying " for " barred " and " mediocre-laying " for " black," the results of mating " high " and " mediocre " birds can be read off the diagrams.

On this three-factor hypothesis it would be possible to obtain nine different types of male, and six different types of female with respect to egg-laying capacity.

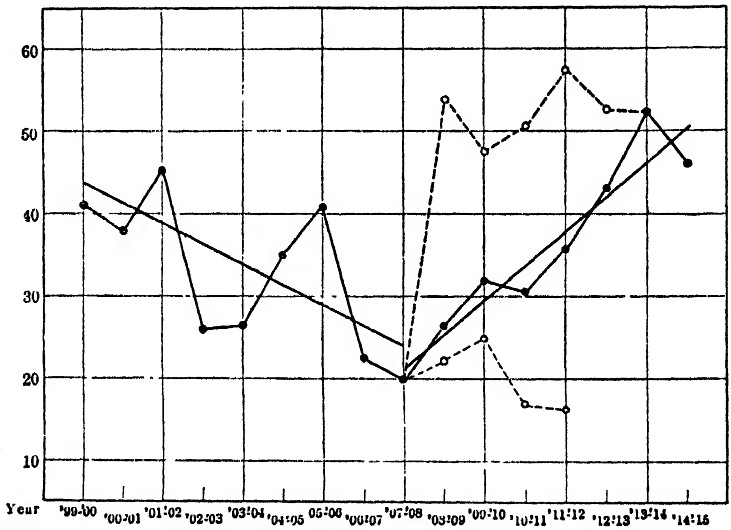


Fig. 8.—A graphic representation of the results of breeding for high winter egg production. Period 1899 to 1907, mass selection; period 1908 to 1915, genotypic selection; the dotted line for low production, the broken line for high production. [*After Pearl.*

Arising out of these researches, Pearl advised the following procedure in poultry breeding :—

1. Selection of all breeding birds, *first*, on the basis of *constitutional vigour and vitality.*
2. Use of such *females* only as have shown themselves high producers.
3. Use of such *males* only as are known to be sons of high-producing dams.
4. Use of a pedigree system.

Since Pearl enumerated his theory, other workers have investigated the problem and have concluded that, with some breeds at least, the mode of inheritance is much more complex—one investigator mentions at least seven factors—and depends, among other things, on maturity, readiness to sit, persistency, winter rest, broodiness. Dr. Pearl's work brought the question

of fecundity in fowls under the notice of the Royal Society of New South Wales, and at its request experiments were commenced in 1919 at the College under the supervision of the Poultry Expert (Mr. Hadlington). This experiment consisted of the mating of White Leghorns and Games. Flock testing only was carried out. The experiment, from which no definite conclusions were drawn, ceased in 1920.

At the further request of the Royal Society, a new experiment was commenced in 1922 using a single breed (White Leghorns) and single-pen testing all females.

In 1922 six cockerels were mated with twenty-three pullets and seven hens; in 1923 fifteen cockerels with seventy-five pullets and fifteen hens; 1924 two cocks and sixteen cockerels with twenty-two hens and sixty-eight pullets; and 1925 fifteen cocks and three cockerels with fifty-two hens and thirty-eight pullets.

It will first be necessary to determine whether there is anything corresponding to a " winter production," and if there be such a thing, at what figure shall we assess low, mediocre, and high layers. If we are to depend on annual production, what criteria are to be taken to differentiate low, mediocre, and higher layers ?

Concurrently it will be necessary to isolate pure lines of both males and females for the various types of laying, *i.e.*, birds which will breed true for the respective types. These two points must be cleared up before commencing any research or study on the mode of inheritance of fecundity, and so far our activities have been concentrated on those two lines. Just as Pearl had to carry out a large amount of tedious analytical work for many years before he was actually ready to commence his " fecundity matings," so we are finding that the task is no easy one. It is difficult to realise the immense amount of tabulation and record work which the investigation entails. The task is not lightened by the fact that the work has to be carried out by a staff which has an abundance of other work, and by the fact that the accommodation for single-pen testing is so limited.

Apart from the recording of eggs laid, there is a vast amount of work involved in the matings, with the pedigree incubation and the marking of chickens. In this latter connection we were just about at our wit's end with regard to combinations of ring colours for leg-banding when we happened to come across an American bulletin on " wing-banding." The system described therein was tried by the College Poultry Instructor (Mr. Lawrence) and has been found entirely satisfactory. This simple system enables one to keep track of birds in all stages of development, and in these experiments, when a large number of birds (both male and female) have to be kept until their records are known, has proved invaluable.

Apart from the scientific aspect of the experiment, you will doubtless ask of what use all this is going to be to the practical poultry-farmer. It is

very difficult to say. The investigation into the mode of inheritance has not really started yet, but the records of the past three or four years tend to emphasise that the egg-record of an individual is not necessarily a criterion of the egg-laying capacity of its progeny, nor does the record of his dam give a reliable index as to the value of the male bird as a breeder. From the records, too, it is apparent that the male, as well as the female, is an important factor in the production of high-producing strains, but whether there is any sex-linkage or not cannot be determined.

With respect to the possibility of making out "a system of matings on the basis of Bulletin 205," Dr. Pearl, in Maine Bulletin 231, says:—"I have refrained from doing this, however, because it seems to me to be of doubtful practical utility. . . . The reasons are general in character and are found in the fact that such schemes of breeding are essentially *mechanical*, whereas both the things to be bred in accordance with the scheme (the *fowls*), and those who are to carry out the plans (the poultrymen) are essentially *living*. . . . Being a little acquainted with the frailties of both poultry and poultrymen, I am not too optimistic as to the outcome of trying to breed chickens by formula."

It has, then, to be recognised that the egg is an end product of a series of complex operations involving the vital processes of the life of the fowl. Fecundity must in some way be influenced by the working of these processes, but its mechanism has not yet been found out, although the poultry-farmer's conception of what fecundity is is simple enough. If we knew what fecundity was we should be able to simplify our breeding methods and systematise the selection of high-producing birds. Heredity, however, is only one factor; environment, management, feeding, and care are always vital to ensure that the innate capacity of the bird shall function to its maximum.

In outlining any general method of selection for improvement of the flock it is generally conceded that the outstanding factors are:—

1. Constitutional vigour.
2. Pedigree and production records of male and female.
3. Standard breed, type, and colour.
4. Early sexual maturity with standard body, size, and weight.
5. Size of egg.

Field Day at Condobolin Experiment Farm.

A Field Day for farmers is being arranged at Condobolin Experiment Farm for 7th October. Much interest has been taken in the work of this farm and in the results obtained compared with the averages of the district, and the day is likely, therefore, to be a unique one.

Dairying Industry in New South Wales.

The Twelve Months, July, 1924, to June, 1925.

L. T. MacINNES, Dairy Expert.*

The dairy herds of this State have this year given a record production, and the quantity of surplus butter exported overseas has exceeded that of any previous year. It is estimated that on 30th June the factories of this State will have produced 115,000,000 lb. of butter for the twelve months. The butter made on farms and sold as dairy butter will amount to about 5,000,000 lb., making a total production of 120,000,000 lb. The previous record was established in 1921-22, when the factories' output amounted to 95,000,000 lb. and the total production to about 100,000,000 lb.

Such comparisons afford a forcible lesson as to the value which feed has in the production of dairy stock. In a normal season we produce about 75,000,000 lb. of butter. The dairy herds responsible for this, average about 120 lb. of butter each cow, taking the herds as a whole, including dry stock and springing heifers. This represents the capacity of each cow to yield in 365 days 150 lb. butter. In the drought years experienced in 1922-23 and 1923-24, the herd average fell to about 98 lb., and the capacity of each cow averaged about 120 lb. This was the effect of drought, and fodder scarcity. In a good season, such as that experienced in 1924-25, the herd average works out at about 185 lb. butter, and the capacity of each cow for 365 days' lactation period would be 230 lb.

On an average we have two good years, two bad years, and six average years in a period of ten years. Working out the losses to the farmer through lack of feed, it can be easily seen that the amount of money involved runs into many millions. The low average production yields of the dairy herds of Australia are not brought about so much by the poor quality of the cattle as by the inadequate food given them. Given plenty of fodder, the testing of the dairy stock for production, and the making available to all dairy farmers of dairy sires of high production strains on easy terms, there should be a revolution in the prospects of dairy farming. This is the lasting way in which to establish the industry.

Dairy Branch officers have been engaged in first grading cream on the factory floors, and then, in cases where inferior quality was found, visiting the farms which produced it and giving instruction how to remedy defects. This work has been expanded to the limit the present staff will permit, and splendid results have been achieved. Owing to the rains which fell throughout the summer, and the excessive mud, &c., there was a heavy infection of milk and cream by micro-organisms which cause bad flavours.

* From an address at the N.S.W. Co-operative Dairy Factory Managers and Secretaries' Association's Conference, Sydney, June, 1925.

Factory Reconstruction and Equipment.

Since the reconstruction of factories commenced in 1920, thirty-three new butter factories and five new cheese factories have been built and equipped, at a cost approximating £370,000. There are now under construction or tenders called for, nine new butter factories and one new cheese factory, at a cost of about £125,000. Plans are being got out for fourteen new butter factories to be constructed during the coming year at an approximate cost of £150,000.

During the same period renovations to plant and premises of other butter and cheese factories have been very extensive, and must total over £50,000. During the last five years there have been closed, or are about to be closed, seventeen butter factories. These were of very small capacity, wretchedly constructed, and under-equipped. Their closure has had the effect of sending supplies to neighbouring factories, which were in a better position to treat same to the ultimate benefit of the farmer.

All this reconstruction [illegible] has had a material effect on quality. If it had not been carried out so extensively, the results during the past year would have been disastrous in this respect. In spite of so much money being spent, the abnormally high production found most factories unprepared—their plants were not big enough to treat the enormous supplies of cream coming in, and the result has been a slip back in quality. The export butter-grading results, when made available, must show a falling off in quality.

Stabilisation of Prices.

While primary producers are undoubtedly entitled to cost-of-production prices, if they can be obtained, reduction of costs on the farms by breeding better stock and feeding them properly, and at the factory and distributing floors by cutting down manufacturing and distributing charges is essential. Consumers will strenuously object to paying for the duplication of these manufacturing and marketing costs, and for the continuation of low-producing, ill-bred herds. The Commonwealth and various State Governments are now giving consideration to ways and means of aiding in improving herds, farms, and fodder reserves.

Impurity of Water Supplies.

Impurity of butter wash water has been found a frequent cause of deterioration in the quality of butter. The matter has received much attention during the year, and filtration of water for use in butter factories has been made compulsory, while the pasteurisation of water is receiving attention.

Boric Acid in Butter.

During the year the British Government passed regulations preventing boric acid from being added to butter. This matter of itself had little concern for New South Wales manufacturers, as it has been our practice for

many years to make butter without adding boric acid. Australia is the only country in the world sending butter long distances overseas that has the necessary machinery and laws to enable non-boric butter to be manufactured of such a quality that it will not deteriorate after two months' storage. In Australia, practically every factory is now equipped with pasteurisers, and every State, with the exception of South Australia, has compulsory cream-grading legislation, and has taken the necessary steps to train cream graders. This is not the case in New Zealand, where they have no cream-grading legislation, and when they do obtain such legislation it will take years to train duly qualified graders to operate in the factories. Nor are the Argentine and Siberia in any better position than New Zealand to cope with Great Britain's non-boric legislation. In addition to not having legislation and trained graders, these two countries have not, so far, equipped their factories with pasteurisers. It can, therefore, be said, to summarise the whole position, that Australia has a lead of at least three years over its competitors in this respect, excepting Denmark and other butter-supplying countries situated close to the English market.

The experience gained in New South Wales in the last eight years in storing butter for winter supplies and for exhibition at the R.A.S. Show and the factory managers' winter show, together with the experience gained in Victoria this year in connection with butter exhibited at the factory managers' show, and further, the experience of all the leading factories in New South Wales, Queensland, South Australia, West Australia, and Tasmania, where choicest butter made from properly graded cream is placed on the market without boric acid being added, all go to show that the inclusion of boric acid in butter is not necessary. These facts should be made public even now, so that we can take the fullest advantage of our unique position.

National Brand.

During the year choicest quality butter and cheese have been exported overseas under a national Australian brand—the Kangaroo. Some three years ago the Government of New South Wales raised the question why our factories were not receiving price for quality, seeing that our choicest butter was recognised as of a higher standard than the average of New Zealand. It was then said that the reason for our lower prices was because Australia placed upon the market too many brands. The national brand rectified this, and it was hoped that our prices for the Kangaroo brand butter would at least consistently equal New Zealand, even though our highest quality warranted us in getting at least 20s. per cwt. more than New Zealand. It should be noted that New Zealand's higher grade butter scores from 88 points upwards, whereas in Australia our minimum for the higher grade is 92 points. The question might well be asked, why have we not received during the past year price for quality, seeing that the whole of our choicest grade was marketed under one brand? It would seem that in this matter, also, the marketing end of our industry continues to leave much to be desired.

Moisture Standard.

During the past year there has been an endeavour in a few instances to incorporate moisture in butter without taking precautions to ascertain if the standard of 16 per cent. was being exceeded. In one or two instances such butter escaped the vigilance of the graders at this end, but the excess was detected at the port of destination, where a strict watch is being kept for this kind of thing, on account of the great increase in the practice of water-logging among some of our competitors on the English market. Companies are warned to keep a check on the moisture content of each churn. Each factory should be equipped with appliances for making rapid moisture examinations for this purpose. The field staff of the branch has been instructed to insist on such appliances forming part of the equipment of each registered factory.

Losses from Under-feeding of Dairy Stock.

Taking the average production capacity of a cow for 365 days in a bad season to be 120 lb. butter, and in a good season to be 230 lb., the difference would be 110 lb. each cow. This, at 1s. per lb., would represent £5 10s.; at 1s. 3d. per lb., £6 17s. 6d. Calculating that there are some 700,000 cows in registered dairies, the loss made by the whole of the herds throughout the State owing to the difference of feed between a good and a bad season would amount, aat 1s. per lb., to £3,850,000; at 1s. 3d. per lb., the loss would amount to slightly over £4,800,000. This demonstrates what good feeding does to the present class of New South Wales dairy stock, and the average yield put up during the past year shows that our dairy herds compare favourably with those of most other countries, *if they are fed.*

On reviewing the last ten years, it will be found that we had three bad seasons, with an average factory production of 59,000,000 lb. each, five medium seasons with an average factory production of 74,000,0000 lb., and two good seasons with an average factory production of 105,000,000 lb.

It can be calculated from these figures what an enormous loss the dairying industry of this State has made owing to under-feeding dairy stock during the last ten years.

Herd Testing.

The testing of dairy stock for production has continued to make progress. Pure-bred cows tested during the year to 30th June, 1925, numbered about 800, as compared with 478 tested last year. There are now under test 741, as compared with 568 for the same period last year. In grade herd testing, the numbers under test have expanded from 9,000 to 23,000. In connection with the testing of grade herds, the scheme in operation on the Tweed-Richmond and Murrumbidgee Irrigation Areas has given excellent results in comparison with those from subsidised associations. It is hoped that from 1st October, if approval is given, everything will be in readiness for this subsidy system to be abandoned, and the whole of the testing of grade herds will be carried on under the direct control of the Department. During the coming year it is expected that the testing of pure-bred and grade herds will show still further expansion. We aim to have at least 30,000 cows on test in grade herds by 1st October this year, and over 1,000 pure-bred

The Apiaries Act.

What its Requirements Involve.

H. GRAHAM SMITH, E.B.S.B.A., Apiarist, Hawkesbury Agricultural College.

The lack of knowledge among bee-keepers regarding the Apiaries Act and its requirements is rather remarkable, there being many bee-owners apparently who are even unaware that regulations governing bee-keeping exist. The chief provisions of the Act may be stated briefly as follows:—

All bees must be registered, whether kept only for private use or otherwise. Annual registration has been abolished; when an apiary is once registered no further registration is necessary. Should an out-apiary be established, however, application for registration should be made, and should a bee-keeper dispose of his bees to another person or alter the location of his apiary, the Department of Agriculture must be notified. No fee is required for registration.

All apiarists must keep their bees in frame hives. The use of box hives is prohibited.

The outbreak of any disease must be reported at once to the Department.

A penalty of £20 is provided by the Apiaries Act for neglect to observe any of these provisions.

The above provisions apply equally to the owner of one hive of bees and to the owner of larger numbers, with no exemptions. Special reference is made in this article to the prohibition of bee-keeping in box hives. The keeping of bees in frame hives in which they have been allowed to build their combs diagonally or in any form that prevents their removal without cutting, is also an offence under the Act. Moreover, the box hive is to be preferred to a frame hive in which the combs have been badly built. The transference of bees from a box hive to a hive which answers the requirements of the Act is an easy matter compared to the cutting out of badly-built combs.

The objects of compulsory use of frame hives are to facilitate the work of apiary inspection and the control and eradication of diseases found in bees. Protection is thus afforded both to the apiarist who keeps a few hives as a side-line and to the commercial bee-farmer who depends upon his bees as a source of livelihood.

The Common Diseases of Bees.

The idea that bees do not suffer from disease is not uncommon, and for this reason the need of apiary legislation is not generally understood. Not only do bees suffer from contagious diseases, but such diseases spread rapidly in hives that are closely populated. Moreover, the robbing habits of bees contribute greatly to the spread of disease. Weakened colonies become a prey to the stronger ones, which in turn become infected, and so the spread of diseases continues.

The diseases of bees may be divided into two classes—those that affect the larvæ in process of development, and those that affect adult bees. For detailed discussion of these diseases readers are referred to Farmers' Bulletin, No. 129: *The Beginner in Bee Culture*; for the purpose of this article the principal ones may be briefly enumerated as follows:—

Brood Diseases.

American Foul Brood.—This is a highly infectious disease, affecting the brood larvæ, and is caused by an organism the spore of which will live in honey for a long period and will produce the disease in any healthy colony to which spore-bearing honey is conveyed through "robbing" or any other means.

A class of Apiary that fortunately has almost disappeared from New South Wales. Such places are literally "hot-beds" of disease.

European Foul Brood.—A disease which, in some respects, resembles the American type. It affects the larvæ at an earlier stage of development, and is not so destructive or difficult to eradicate.

Brood of bees will also die if chilled, but such brood presents a different appearance to diseased brood, and when cleaned out by bees does not reappear.

Adult Bee Diseases.

Paralysis.—Little of a definite character is as yet known of this disease. It is regarded by some authorities as mildly infectious, but rarely spreads

to any extent or causes very serious loss. Treatment by the introduction of a young queen from another strain by the use of a prescribed method is simple and effective.

Dysentery.—The principal cause of this disease is probably long confinement in the hive at a low temperature during inclement weather, together with the consumption of honey which is unsuitable for winter food. Its presence is characterised by brown spots and stains, with a disagreeable smell, noticeable at the entrance and on the frames. The advent of sunny weather does much to effect a cure. The best preventive measure is provision of a warm compact brood nest to winter in, furnished with a good supply of well-ripened stores.

A "close-up" of part of the same Apiary.
Many hives in the apiary were in this condition.

Nosema apis.—In many respects this disease resembles paralysis. It is attributed to the presence of internal parasites, large numbers of which infest the bowels of worker bees, causing heavy mortality. In severe cases colonies are sometimes greatly reduced in strength before the honey-flow, which results in almost complete failure. Experience has shown that where the vitality of the strain has reached a low ebb the disease will make progress, whereas a vigorous strain will resist it.

Spring Dwindling.—This complaint is recognised by mortality of adult worker bees in spring, when the dead bees will be noticed about the entrance of the hive. It is probably due, in some degree, to malnutrition of the workers, and is sometimes accompanied with dysentery. The causes of disorders among adult bees have not been thoroughly investigated by competent scientists, and reliable datum is therefore not available.

Acarine Disease.—This, the worst of known bee diseases, is not found in Australia. It originated in the Isle of Wight, from whence it gets its vernacular name, and spread throughout Britain, where it is seriously affecting the industry at present. It is caused by the infestation of breathing hollows situated in the thorax of worker bees by a mite which breeds extensively and causes heavy mortality.

Ancient and Modern Honey Production.

There is no phase of honey production to which modern science has not been applied, hence bee-keeping holds a place among the improved and rapidly advancing branches of rural industry. The possibilities of development which it possesses have made the application of assured scientific knowledge indispensable, mainly because its ultimate success depends upon the proper understanding and utilisation of natural processes.

Progress and development, then, demand the use of hives, which, in size, type, and dimensions are rigidly accurate, offering every comfort to the bees, with facilities for building and storing that give maximum returns from each colony. The Langstroth ten-frame hive, which is the most popular in Australia, meets all these requirements. Standardisation of apiary equipment is another point which saves a lot of trouble, and helps towards success.

The advantages of careful planning and location of hives is becoming more recognised, and apiaries of the class shown in Fig. 1, in which not a single frame is used, are now rarely seen.

Fig. 2 illustrates how, owing to the discomfort of the bees due to lack of storage space, they were compelled to gnaw a hole in the bottom board—consisting of a sheet of paper-bark—and build their combs beneath, extending to the ground. Poor returns are obtained from bees kept in hives of this kind, and from a commercial point of view they are useless. An outbreak of foul-brood in such an apiary would reach a very advanced stage of development before it could be detected, and would be a source of infection to other apiaries for miles around.

Transferring Bees from Box to Frame Hives.

Not infrequently, bees in box hives have to be conveyed some distance to where it has been decided to establish them. If the distance to be covered is not more than a few miles and the number of boxes not more than two or three this work is not difficult, and they may be conveyed in a horse-drawn vehicle, care being taken that the bees are securely shut in with wire gauze or other material that will allow ventilation. The essential points in transporting are outward temperature, ventilation, and security of combs.

To begin with, two or three pieces of plain fencing-wire should be passed through each side of the boxes and combs in the form of skewers. These wires, if long enough to reach the opposite wall of the hive, will make the combs rigid and thus prevent any loss of bees through the friction of one

comb against the other, or from dropping. Sufficient ventilation for transport may be given by placing the hive in an open-meshed chaff bag if the colony is not too strong, providing that one side of the box is entirely open, the weather moderately cool, and the distance to be travelled not more than a few miles. The loading of boxes upside-down is an additional advantage, as bees, when disturbed by moving, have a tendency to cluster over combs on top of the hive, which naturally contain most honey. There is, therefore, a greater danger of such combs melting down by the increased heat and weight applied to them. This the inversion of the boxes counteracts. The boxes must not, however, be loaded on top of one another, unless supported on a rack 3 inches above the bottom tier. It is important in loading on to the lorry or dray that the combs be parallel with the axle of the vehicle.

An up-to-date Apiary.
Hive stands laid out in rows of ten.

Where a number of box hives have to be shifted, a motor-lorry should be used. The risk of accidents that always accompanies the removal of bees on a horse-drawn vehicle is eliminated, the riding is easier, and transport quicker.

Transferring, as referred to in this article, applies to the removal of bees from a box or other imperfect hive to a regulation hive with frames. The best time to carry out the process is in the spring during the first honey flow. Brood rearing is not then in full swing and combs are not over-laden with honey. The danger of robbing is also minimised by the presence of nectar in the fields. The work should be carried out on a sunny day when most of the field bees are out. The bee-keeper must provide as many standard hive bodies, bottom boards, and hive covers as he has boxes to transfer

and the necessary number of frames. The following requisites for the work should be provided beforehand:—Smoker, bee-brush and veil, hammer and chisel, a ball of twine, a spare box, a long-bladed knife and a hive cover to operate upon when fitting combs into frames.

Commence by giving the colony a few blasts of smoke at the entrance; then remove the box two or three paces to the rear of its stand. Substitute for the box another hive containing a frame of brood, if available. This will make the returning bees more contented until the operation is completed. The old hive may now be turned open side upwards or a board may be removed from the top. Place upon this the spare empty box, open side downwards, and secure by putting a weight on top. Drum the bottom hive with two sticks and continue until the majority of the bees with the queen have clustered in the upper box. They are then shaken on a run way in front of the new hive on their old stand.

The position of the combs in the old hive is next examined and the side removed that will give access to the best ones first. Only the straightest pieces containing brood and honey in worker cells should be selected for tying into frames. To fit the combs into frames, first lay the pieces on the operating board over four pieces of string, Place the frame on top and cut the comb to fit the frame neatly. Remove the fragments from the edges, press the frame down into position and tie. Combs are less likely to get out of plumb if the honey, which is heavier, is put at the bottom of the frame. The smaller pieces of brood comb should be fitted together and tied into frames in the same way. As each comb is completed, it is given to the bees in the new hive, placing them compactly together. Frames containing full sheets of comb-foundation may be added outside the tied-in combs according to the strength of the colony. As an extra precaution against robbing, all scraps of comb containing honey must be carefully enclosed in a tin during operations. The scraps are afterwards pressed for their honey and melted up for beeswax.

In about a week, the hive may be examined, and if the combs have been made secure, the strings may be removed, as they are a source of annoyance to the bees. Such combs are not up to standard although valuable when filled with brood and food. They should be culled out at the first opportunity and replaced with good well-wired combs or full sheets of comb-foundation, as the type of comb used in the brood chamber is a very important factor in successful bee-keeping. This method of transferring may commend itself to one who has had a little experience with bees who wishes to hasten the work of establishing the bees in new hives.

Another Method of Transferring.

This is a simpler method for the inexperienced than the one described. It consists of merely turning the box with bees upside-down on its stand and allowing the bees to gradually transfer themselves. The box is prepared as before by inverting, after which, a hive is placed on top. This hive should contain a comb of brood and on each side a sheet of comb-foundation. The

bees are drummed up as before and a queen excluder inserted between the two bodies. The entrance to the hive must be above the queen excluder, all other cracks being sealed up. If, on examining the upper chamber, eggs are found on the fourth day from the date of transferring, the queen may be regarded as present and the operation so far, successful. The queen being unable to return through the excluder to the box, it only requires to be left there for twenty-one days, when all the brood will have emerged. It can then be removed and the combs melted up for wax. At the same time the top chamber may be set down in position on a bottom board. During the period of transfer much of the honey from the bottom box will be removed to the upper hive, thus creating a stimulus and hastening the development of the colony. Empty combs or frames with full sheets of foundation should be added to the hive as required.

This method of transferring should be adopted especially where bees are being transferred from a frame hive in which the combs have been built irregularly.

Having thus established the bees in movable frame hives that conform to the regulations, their habits may be studied at leisure, and the beginner will have completed the first important step towards successful bee-keeping.

Important Points in Starting.

Success or failure is often determined by the method of beginning with bees, and it is well to avoid if possible the purchase of bees in old boxes, and the consequent necessity for transferring, which process is itself sufficient to dampen the ardour of one who is unacquainted with the work. There is also the risk of introducing disease. The better way is to purchase outright a hive (or hives) which (unless purchased from a reputable breeder) has been previously examined by an expert to certify its freedom from disease. Consult a text-book and become familiar with the queen, workers and drones, and their life history and functions. This is a most fascinating study, but it sometimes prompts the too frequent disturbance of the bees, much to their detriment. Guard against this practice and handle them as little as possible apart from the occasions when they need attention. Allow the bees to swarm once, in order that experience may be gained thereby, and follow closely the text-book methods of preventing "after" swarming. Bear in mind that one strong colony will store a greater surplus of honey than two of medium strength. Study the main sources of the honey flow and aim at having colonies at their maximum strength before it opens. Remember that, upon the queen depends all that is hopeful in bee-keeping. Italian bees are prolific, quiet, and excellent honey-storers. Queens of this strain can be bought and introduced to any hive of bees, following the directions supplied with the cage.

In handling bees, use the smoker judiciously and avoid punishing them unduly. Harshness and hasty motions are quickly detected and resented; hence, all operations should be carried out gently, deliberately and without fear.

Do not extract too closely in autumn. Remember that a super of honey left on each hive with a good queen ensures good wintering and a strong colony in spring, ready for the honey flow when it commences.

Successful bee-keeping, in effect, is the application of various principles for the purpose of so repressing natural colonising instincts that the bees' entire strength is utilised in the storing of honey. In their efforts to this end it is not surprising that we find among amateur bee-keepers so many keen experimentalists. While this spirit is to be admired, it is found as a general rule to be carried too far and much time and energy is wasted in trying out methods and appliances that have long since been weighed and found wanting by experts in the craft. The beginner would be well advised to obtain the departmental bulletin previously mentioned and to subscribe to some good bee journal, preferably one published under local conditions. The use of such literature will bring him up to date in practice, if not in experience, and will contribute greatly to his ultimate success.

Clipping of Dairy Cows.

What had been the experience of the Department in relation to the clipping of dairy cows, ran a recent inquiry. In the United States the practice of clipping the udders and flanks was general, and the consensus of opinion there seemed to be that the operation induced a greater flow of milk of better quality, the result of the comfort the animals enjoyed from the hair being kept short on the parts mentioned.

Clipping, the correspondents were advised, will neither increase the flow nor the quality of the milk; this is a matter entirely under the nervous control of the cow. With all the experiments that have been carried out throughout the world, the scientist has not discovered any method of materially increasing butter-fat in milk. The main factors in increasing the milk-flow are better breeding and feeding and kinder handling. Of course, where a cow has a long growth of hair on the udder, and this is allowed to become matted, the cow becomes somewhat irritated at milking time if the milker is inclined to be rough, and from this cause no doubt a few cows may retain their milk. The departmental practice has been to clip the udders of any cows that have excessive hair growth, but this has been done solely with a view to cleanliness. At the same time it must be said of this practice that it coarsens the hair, which has to be continually clipped. It is also a disadvantage when the flies are bad, as the hair is a protection against the fly pest. Better results are obtained by rugging the cows to keep the hair short and fine, and washing the udders with clean water. Then, with careful milking and judicious feeding, a far greater flow of milk is obtained than by clipping. No doubt in some types of cow which have long hair, and which are milked by persons who are not as careful as they should be in washing and keeping the udders clean, or where the cows have access to muddy dams or streams, clipping would have its advantages.

In America cows are clipped for hygienic reasons, and not, so far as the writer is aware, with a view to increasing the milk production.—J. A. Robertson, Herdmaster.

Experiments for the Control of Black Spot of Apple.

DUE TO THE FUNGUS *Venturia Inæqualis* (CKE.) ADERH.

W. A. BIRMINGHAM, Assistant Biologist, and H. A MILLS, Orchard Inspector.

BY the courtesy of Mr. Rose, Penrose, a number of trees were placed at the Department's disposal for an experiment on the control of "black spot" of apple. Granny Smith was the variety treated and five trees were used in each series, while five trees were left as controls.

Plan of the Experiment.

Trees Nos. 1, 2, 3, 4, and 5 were sprayed with lime-sulphur (summer strength) beween early spur-burst and pink stages, followed by lime sulphur (summer strength) at the calyx stage.

Trees Nos. 6, 7, 8, 9 and 10 were sprayed with Bordeaux mixture (6-4-50) between early spur-burst and pink stages, followed by lime-sulphur (summer strength) at the calyx stage.

Trees Nos. 11, 12, 13, 14, and 15 were sprayed with Bordeaux mixture (6-4-50) between early spur-burst and pink stages, followed by Bordeaux mixture (6-4-50) at the calyx stage.

The first application—between early spur-burst and pink stages—was made on 24th September, 1924. The second application at the calyx stage was made on 13th October, 1924. Commercial lime-sulphur was used, and the Bordeaux mixture was prepared immediately prior to application. The crop was picked, classified and counted on 12th May, 1925.

The following table shows the result of the experiment for the season 1924-25:—

	Clean.		Light Spot.		Bad Spot.	
	No.	Per cent.	No.	Per cent.	No.	Per cent.
Results from Lime-sulphur Followed by Lime-sulphur.						
Tree No. 1	33	43·4	29	38·2	14	18·4
„ 2	25	10·8	100	43·1	107	46·1
„ 3	13	7·6	99	57·9	59	34·5
„ 4	18	6·0	165	55·0	117	39·0
„ 5	62	18·2	182	53·5	96	28·2
Average	30·2	17·2	115	49·5	78·6	33·2

	Clean.		Light Spot.		Bad Spot.	
	No.	Per cent.	No.	Per cent.	No.	Per cent.
Results from Bordeaux Mixture (6-4-50) Followed by Lime-sulphur.						
Tree No. 6	76	50·0	44	28·9	32	21·1
„ 7	158	63·9	64	25·9	25	10·1
„ 8	100	58·1	56	32·5	16	9·3
„ 9	170	78·7	35	16·2	11	5·0
„ 10	53	58·8	32	35·5	5	5·6
Average	111·4	61·9	46·2	27·8	17·8	10·2
Results from Bordeaux Mixture (6-4-50) Followed by Bordeaux Mixture (6-4-50).						
Tree No. 11	119	95·9	5	4·0	0	0
„ 12	51	98·0	1	1·9	0	0
„ 13	227	91·2	20	8·0	2	0·8
„ 14	8	72·7	3	27·3	0	0
„ 15	164	83·2	32	16·2	1	0·5
Average	113·8	88·2	12·2	11·5	0·6	0·3
Results from Control Trees (untreated).						
Tree No. 16	0	0	61	45·9	72	54·1
„ 17	10	12·3	26	32·1	45	55·5
„ 18	18	7·3	189	76·5	40	16·2
„ 19	18	4·0	211	47·4	216	48·6
„ 20	10	18·2	26	47·3	19	34·5
Average	11·2	8·4	102·6	49·8	78·4	41·8

It will be seen (1) that Bordeaux mixture (6-4-50) between early spur-burst and pink stages, followed by Bordeaux mixture (6-4-50) at the calyx stage, gave the best control of the "black spot" fungus (*Venturia inæqualis*) at Penrose, with 88·2 per cent. clean fruit. (2) Bordeaux mixture (6-4-50) between early spur-burst and pink stages, followed by lime-sulphur (summer strength) at the calyx stage, with 61·9 per cent. clean fruit, was next in order of control. (3) Lime-sulphur (summer strength) between early spur-burst and pink stages, followed by lime-sulphur (summer strength) at the calyx stage, with 17·2 per cent. clean fruit, gave the least amount of control.

In the series Bordeaux followed by Bordeaux, russeting varied from slight to pronounced, without cracking of the fruit. An examination of this series revealed no hardening or other detrimental effect on the trees due to these sprays.

Bordeaux mixture followed by lime-sulphur produced slight russeting in some cases.

In the series lime-sulphur followed by lime-sulphur russeting did not occur, and the clean fruit was of good appearance.

The Poisoning of Fruit Flies.

The Killing Efficiency of Certain Arsenicals.

T. McCARTHY, Assistant Entomologist.

In the year 1922 certain laboratory tests were carried out primarily to determine the most satisfactory poison for fruit fly lures in traps, and also to determine the relative toxicity of arsenate of lead used in the poison foliage spray. It was not intended at the time to publish the results, but in view of the work now being carried out in the control of the fruit fly (*Ceratitis capitata*) it may prove worth while to publish these notes as a suggestion for more extensive work along somewhat similar lines.

All the flies used in the experiments were bred in the laboratory from infested fruit. They were placed in glass lamp chimneys 18 inches long by 6 inches diameter and allowed to remain for a few days before being fed with the poison mixtures. This ensured the flies feeding more rapidly when fed. The flies were fed at least once a day, the liquid being flicked through the cloth cover at the top on to the inside of the chimney.

The arsenicals tested included white arsenic (arsenious oxide), sodium arsenite, potassium arsenate, calcium arsenate, and lead arsenate. The poisons were in all cases fed to the flies in a mixture of molasses and water.

The following were the results obtained:—

Lead Arsenate :- Formula, 3 oz. arsenate of lead (powder), 1 lb. molasses, and 3 gallons of water.

1 fly died in ...	... ... 25 hours	3 flies died in	... ... 69 ,,
8 flies died in	... ... 41 ,,	18 ,,	.. ... 72 ,,
32 ,,	... ... 65 ,,	21 ,,	... ... 89 ,,

Calcium Arsenate :—Formula (*a*), 1·8 oz. calcium arsenate, 1 lb. molasses, and 4 gallons of water.

6 flies died in	... ... 16 hours	3 flies died in	... ... 64 hours
21 ,,	... .. 40 ,,		

Calcium Arsenate : Formula (*b*), 3 oz. calcium arsenate, 1 lb. molasses, and 3 gallons of water.

7 flies died in	... ... 21 hours	2 flies died in	... ... 44 hours
2 ,,	... ... 24 ,,	4 ,,	... ... 65 ,,
11 ,,	... ... 41 ,,	1 fly died in	... ... 69 ,,

Arsenious Oxide :—Formula, 1 oz. arsenious oxide, 1 lb. molasses, and 4 gallons of water.

15 flies died in	... ... ½ hour	3 flies died in	... .. 3½ hours
15 ,,	... ... 1 ,,	1 fly died in	... . 4 ,,
3 ,,	... ... 2 hours	3 flies died in	.. ... 21 ,,
12 ,,	... ... 3 ,,	7 ,,	... ... 24 ,,

Sodium Arsenite :—Formula, 1·8 oz. sodium arsenite, 1 lb. molasses, and 4 gallons of water.

4 flies died in	½ hour	1 fly died in	3½ hours
13 ,, ...	1 ,,	3 flies died in	18 ,,
4 ,, ...	1½ hours	2 ,, ...	20 ,,
1 fly died in	2 ,,	1 fly died in	21 ,,
7 flies died in	2½ ,,	1 ,, ...	26 ,,
7 ,, ...	3 ,,	2 flies died in	68 ,,

Potassium Arsenate :—Formula, 1·8 oz. potassium arsenate, 1 lb. molasses, and 4 gallons of water.

8 flies died in	1 hours	2 flies died in	3½ hours
3 ,, ...	1½ ,,	29 ,, ...	16* ,,
4 ,, ...	2 ,,	1 fly died in	40 ,,
5 ,, ...	2½ ,,	1 ,, ...	69 ,,

* Flies first fed at 5 p.m.; probably death occurred in a much shorter period during night.

Potassium Arsenate :—Formula, half above strength.

5 flies died in ... 1½ hours
5 ,, ... 19½ ,, during night

In all these tests the times were taken from when the poison mixture was placed in the chimney, and not from the times the flies began to feed. Some of the flies did feed immediately the poison bait was placed in the chimney, but some time may have elapsed before others began to feed. Throughout the tests the flies were fed daily, and were thus compelled to feed continuously on the poisonous solution. The experiment differs from field conditions in that the poison is applied only every seven to ten days on a small patch of the tree, and the flies are therefore not compelled to and do not feed continuously on the poison. This would probably influence the killing efficiency of calcium arsenate and lead arsenate in the field when applied to the tree as a spray, as the flies apparently require more than one feed to be affected by either of these poisons.

Seeing that the majority of the flies compelled to feed upon lead arsenate solution took from sixty-five hours to ninety hours to die, it seems reasonable to think that the time under field conditions must be considerably prolonged, or even that the killing efficiency of the spray as at present recommended, is negligible.

On the figures obtained, calcium arsenate appears to be more satisfactory, even when used at half the strength of the lead arsenate, but here also more than one feed seems to be necessary to kill the flies.

The three other poisons tested are, of course, much more toxic, and one feed seems to be quite sufficient to kill the flies. Whether any of these can be used as a foliage spray at a reduced strength without injury to the foliage, while maintaining a higher toxicity than lead arsenate may be worthy of experiment.

Tests with individual flies were also made, using white arsenic, sodium arsenite, and potassium arsenate. One was placed in each test tube and

fed with the poison mixture. The time taken by the fly to die was estimated from when the fly was first fed upon the liquid. The results were as follows:—

White Arsenic:—Formula, 1 oz. white arsenic, 1 lb. molasses, and 4 gallons of water.

No. 1	fly affected in	48	minutes, died in	78	minutes.
,, 2	,,	22	,, ,,	32	,,
,, 3	,,	15	,, ,,	26	,,
,, 4	,,	20	,, ,,	25	,,
,, 5	,,	38	,, ,,	78	,,

Sodium Arsenite:—Formula, 1·8 oz. sodium arsenite, 1 lb. molasses, and 4 gallons of water.

No. 1	fly affected in	45	minutes, died in	75	minutes.
,, 2	,,	20	,, ,,	35	,,
,, 3	,,	22	,, ,,	35	,,
,, 4	,,	20	,, ,,	25	,,
,, 5	,,	22	,, ,,	31	,,

Potassium Arsenate:—Formula, 1·8 oz. potassium arsenate, 1 lb. molasses, and 4 gallons of water.

No. 1	fly affected in	28	minutes, died in	65	minutes.
,, 2	,	35	,, ,,	45	,,
,, 3	,,	40	,, ,,	65	,,

"Butter and Cheese"

One of Lockwood's Manuals (practical books for practical men), this little book of under 100 pages, aims at being of service to the maker of butter and cheese, and at the same time to the merchant. To the one the avoidance of defects in the product of the factory, and to the other the detection of the defects are important, while the consumer's interest is that the other two should know their respective jobs. The Dairy Branch of the New South Wales Department of Agriculture has published a large amount of matter of a similar kind; but it will no doubt be of considerable utility to have the information within one pair of covers, while there is also no little advantage in having it presented in fresh terms and in a slightly different setting.

Our copy from the publishers, Crosby, Lockwood and Son, London.

A Motto for the Pig Breeder.

It is impossible to lay too much stress upon the folly of breeding from a mongrel, or even a first-cross animal. Judicious crossing of pure breds is not mongrel-breeding, and there may be occasions when a certain cross will produce a pig better suited to particular requirements than one which is entirely pure. But in view of the important fact that it costs no more—and actually less—to keep a good pig than a bad one, there is no object whatever in keeping and producing mongrels. Mongrels can never breed anything but mongrels, even though some of these may be better than others. There is no room for taking unnecessary risks in the business of animal production, however, so that the old adage "the best is the cheapest in the long run" should ever be the motto of the pig breeder throughout the world.—Alec Hobson, in "British Pigs for Profit."

Imports and Exports of Fruit.

The following table, compiled by the Government Statistician, shows the imports and exports of fruit—fresh, dried, and processed—during the quarter ended 30th June, 1925:—

Description.	Imports.	Exports.
Interstate.	Cases.	Cases.
Fresh Fruit ...	559,490	118,899
Tomatoes ...	25,959	...
	doz.	doz.
Melons ...	......	3,880
	lb.	lb.
Canned Fruit ..	9,940	140
Dried Fruit—		
Unspecified ...	6,104	196
Currants ..	6,608	...
Raisins .	7,112	...
Apricots ..	700	..
Apples ...	1,960	...
Prunes ...	1,428	12,152
Pears	1,512	...
Sultanas ...	448	...
Peaches ..	1,932	...

Description.	Country of Origin.	Imports.	Exports.
Oversea.			
Fresh Fruit—		Centals.	Centals.
Citrus	... .	457	4,907
Apples ..	....	...	7,860
Pears	....	...	1,447
Pineapples ...	.. ..	...	722
Bananas ...	... .	466	26
Other	....	190	2,930
Dried Fruit—		lb.	lb.
Apples ...	....	...	600
Apricots ...	.. ..	...	3,119
Currants	....	...	3,624
Prunes ...	U.S.A.	18,440	2,684
Peaches ..	....	...	1,044
Raisins—			
Sultanas ..	....	..	964
Other ...	Egypt	68	980
	Spain	2,002	...
	U.S.A.	267	...
Dates	Mesopotamia ...	103,667	5,070
Other	Asia Minor ..	28,617	1,275
	China	2,308	...
	Egypt	58	...
	Italy	10	...
	Spain	450	...
	U.S.A.	1,197	...
Preserved in liquid—			
Apricots ...	....	...	467,820
Peaches ...	....	..	1,456,420
Pears ..	....	...	75,544
Pineapples ...	....	...	6,525
Raspberry Pulp	.. ..	...	637
Other ...	....	..	22,557

Advantages of Feeding Horses Individually.

When arrangements to such an end are practicable, each horse should be fed separately; the custom of feeding many horses from long troughs is wasteful and leads to the bolting of the feed on the part of greedy animals and the underfeeding of those weaker or of more slow-eating habit. Bolting of the food and consequent imperfect mastication prevents the animal deriving the full benefit of its ration, as much is passed through improperly digested—often with serious results. With teams continually on the move, long trough feeding may be unavoidable; but in standing camps and on farms the extra labour and cost involved in providing partition rails should be more than recouped by feed economy and lessened risk. The use of nose bags is worthy of greater consideration than it receives, for they provide a method of accurate feeding, ensuring extra feed to those animals which require it.—From "Safeguarding Farm Stock from Disease" (Farmers' Bulletin, No. 137).

Storage of Lemons.

SOME FURTHER TESTS.

W. B. STOKES, Orchard Inspector.

TESTS for the storage of lemons were initiated by the Gosford District Citrus Packing House in conjunction with the Department of Agriculture in the season 1923. A report of those tests appeared in the *Agricultural Gazette* of October, 1924. Further tests were conducted with main crop lemons in 1924, the results of which are reported hereunder.

Handling the Fruit.

A number of methods of storing were tried in 1923, but two only were persisted with during 1924, namely (1) in paper-lined cases, and (2) in unlined cases. The fruit was clipped during May, June, and July, the greatest care being exercised to avoid damage in gathering and at all subsequent times. It was clipped, leaving as little stalk as possible, two cuts usually being necessary—one to sever the fruit from the tree and a second one to clip the stalk quite close to the button of the fruit. It was found that faster and more careful work could be done this way than in trying to sever and finish in one cut from the tree. The fruit was put straight into the cases in which it was to be stored. The bulk of the fruit was green when clipped, or had only just a slight amount of colour, and as nearly as possible, *judging by the eye,* ranged from 2½ to 2¾ inches. Storage of tree-ripe lemons cannot be recommended, as these tests have shown that such fruit, if held for any length of time, becomes too dark in colour to please buyers. These tests have not so far shown, however, that coloured fruit will not keep as well as green or partly-green fruit.

Two makes of clippers were used—Tuttle's and Wiss. Careful work with a minimum of damage to the fruit can be done with both these clippers; but much faster work can be done with the Wiss.

A cotton glove was worn on the hand holding the fruit. The fruit was obtained from a number of orchards; some on hillsides, some from valleys, and others from almost on the seashore. The class of fruit ranged from fine-skinned specimens taken from trees of mature age to extra large coarse ones from very young trees, and specimens from trees diseased by verrucosis (rust). There is no necessity to stress the point that in any commercial effort to store lemons, diseased ones should not be put down at all.

After clipping and to avoid damage to the tender rind of the fruit, the lemons went under a toughening process by holding them in cases at the orchard for a number of days (up to seven) before removing them to the place of storage. In some instances the fruit was stacked in cases and left out in the orchard, and no damage appears to have resulted from this treatment.

Place of Storage.

It should be explained that the lemons under test were grown within a mile of the sea, in a humid climate and stored in the same climate. The place of storage was at Mr. H. Bassan's property, at Terrigal, underneath a weather-board house built on piles standing about 7 feet out of the ground. To afford protection from drying winds, bagging was stretched around some of the piles, forming an enclosure in which the fruit was stored, the object being, if possible, to maintain a high relative humidity and a reasonably low temperature. With the same object in view, as the weather became warmer in the spring, bags were placed over and around the stored cases of fruit.

Good results have been obtained by storing under these conditions this season, but it is confidently expected that better results would have been achieved if means had existed to regulate temperatures and humidities. During the winter months, no special arrangements were needed to maintain these conditions, but once the warm weather and drying winds of spring set in, temperature and humidity fluctuated considerably. To note these fluctuations, a dry and wet bulb thermometer was installed, and during the months of August, September and October readings were taken three times a day—at 8 a.m., 1.30 p.m. and 8 p.m.

Period of Test.

The fruit was put down in May, June and July, and the test concluded at the end of October. Some of the fruit, therefore, was in store over five months. Once put in store as little handling as possible took place. The cases were examined periodically, and decayed fruit removed, but no general overhauling of the fruit was permitted. Decay can usually be traced by the smell, and only boxes in which decay was known to exist received particular attention. Provided the fruit is in good condition the less handling it has the better. It was noted that a few decayed fruits were found within, say, fourteen days after clipping, after which a long period elapsed before any further decay was found. This early decay was, no doubt, the result of injuries received during clipping, thorn pricks, &c.

Practically all decay was the result of an injury, blue mould commencing at the point of injury and eventually invading the whole of the fruit. A brown rot was noted on several lemons, the nature of which was not investigated. Specimens, also, which developed spots during storage were submitted in October to the Biological Branch of the Department. On examination, these spots proved to be the initial stages of black spot. This is interesting, in view of the fact that these lemons were in store at least three months before the disease became evident, which suggests that this disease enters the fruit long before it makes it appearance on the surface of the rind.

There were eighty-two cases of lemons put down, out of which seventy-five cases of packed fruit were placed on the market; the total loss, therefore, was approximately seven cases. No actual count was made of the

loss from decay, but it is safe to assume that the bulk of this loss was the result of shrinkage of the fruit. Of the seventy-five cases marketed, one case was packed from fruit put down in May, exhibited at the Gosford Citrus Show on 23rd August, 1924, and sold two days later. Twenty-two cases were marketed on 18th September. This lot had to be marketed to save loss; they were stored in unlined cases. They lost their attractive colour and began to wither through heat and drying atmosphere, and would soon have lost all commercial value. The balance (fifty-two cases) was placed on the market on the 4th November, 1924. This fruit had been stored in paper-lined cases, and was a fair average sample of stored lemons. The colour was good, the rind tough without being withered, the stalks were green, and had in most instances calloused over the cut edges and were firmly attached to the fruit. It was considered, however, that the fruit had reached the limit of the period of keeping in store and it was decided to place it on the market. The fruit met a ready sale, the comments of Mr. McDermott, the manager of the Gosford District Citrus Packing House, being as follows:—"Prices realised, taken on the average, were 4s. per case above those obtained for fresh green lemons marketed in May, June and July. In addition, the cured lemons were well received by buyers, who have no confidence in the keeping qualities of the green lemons."

Temperatures and Humidities.

Unfortunately, the readings from the dry and wet bulb thermometer give very little definite information in regard to the temperatures and humidities at which to hold the fruit, owing to the fact that there were no means of holding temperatures, &c., to any particular readings; but from these two years' tests, as well as from other lemon-storing tests carried out by the writer, it is evident that high relative humidities and fairly low temperatures are necessary to hold lemons over long periods. As a working basis, it is suggested that the temperature be held below 70 deg. Fah., and the relative humidity maintained at between 80 and 85 per cent.

Summary.

Lemons may be successfully held in such a store-room as described here over a period of several months.

Better results have been secured by storing in paper-lined cases than in unlined cases.

Very careful handling is always necessary, in all operations.

The number of handlings should be reduced to a minimum. Once the fruit is put in store handling is necessary only to remove decayed fruit.

Green fruit when clipped produces a better cured lemon than tree-ripe fruit.

These tests have not shown that tree-ripe lemons do not keep as well as green lemons. Tree-ripe lemons become too dark in colour after a short time in store, and should not be put down in any commercial effort of storage.

A toughening period of about seven days should be allowed the fruit, so as to avoid damage, before it is removed any distance from the orchard, prior to going into store.

A fairly low temperature and a high relative humidity are necessary in the store-room. Temperature at or below 70 deg. Fah. and relative humidity at from 80 to 85 per cent. are suggested.

While ventilation is necessary in the store-room, drying winds that reach the fruit are fatal.

TRAINING THE HORNS OF JERSEY CATTLE.

WHAT was the method usually adopted by the Department for training the horns of its Jersey cattle, inquired a correspondent recently. He had a Jersey bull about a year old, stated the writer, but although he was an exceptionally well-bred animal the fact that he had straight horns would necessitate some treatment in preparation for show.

The correspondent was informed that he had left the treatment until rather late, and advised as follows :—

The operation should be commenced as soon as the horns are sufficiently developed to stand the strain, probably at about six months of age. The methods usually relied upon are weight and tension. If the horns are growing straight the initial procedure in the young calf is to weaken the inside or front horn by filing portion of it away. This tends to allow the rear portion to grow and bend the horn round If this is not proving immediately successful, a small hole should be drilled in the end of each horn and a piece of light but strong pliable wire put through each hole, and the tension gradually increased. Care must be taken, however, not to put too much tension on the wire or try to force the pace, otherwise the horns may snap off at the butts, and if this tension is applied when the calf is too young, before the horns are sufficiently developed, there is a tendency to pull the shell off. With a calf twelve months old, where the horns are growing straight out, probably the filing and tension will not be sufficient. In such cases a small tenon saw may be used to make incisions about an inch apart on the inside of the horn but not quite to the quick. Tension is then put on the horn and it can gradually be pulled in. Again care must be exercised, as there is a very great danger of the horn being snapped. In the case of a horn cocking upwards in the early stages, heavy bolts should be screwed on the end of the horn and later the wire stretched between the horns, and anything from 2 to 6 oz. of lead, according to the weight and strength of the horns, placed on the wire. This has a tendency to draw the horns downwards, while the wire prevents them from spreading outwards. There are various designs of horn trainers on the market, obtainable from several city firms with instructions as to how they should be used. The training of the horns of young cattle, however, is a matter that can only be learnt by general experience and experiment.

Care must be taken, where the calf is allowed to run with other young bulls, to watch that in playing they do not snap the wire.—J. A. ROBERTSON, Herdmaster.

Poultry Notes.

SEPTEMBER.

JAMES HADLINGTON, Poultry Expert.

THIS hatching and rearing season gives promise of being one of the best for many years. Good hatching results and above the average of rearing are seen everywhere. Added to this, there is a good deal more activity and a greater confidence in the industry than has prevailed for some time. If one may judge from the business being done in day-old chickens and the extra hatchings of established farms, there is an indication of 25 per cent. more chickens being raised this season than in any previous one. Thus is the history of the poultry industry repeating itself, insomuch that a couple of quiet years are usually followed by more activity.

Just why there should be such increased hatchings when the cost of feeding is higher than during the quieter years is somewhat difficult to understand, except that it is the outcome of more profitable operations during those years. Assuming that the explanation is to be found in this factor, it is confirmation of the view (repeatedly put forward in these notes) that the farmer who settles down to hatching his regular quota of chickens every year, irrespective of the immediate outlook, is the better off for his consistency, while the farmer who is influenced by every "wind that blows" is the unsuccessful one.

However, this increased activity in the industry means, of course, expansion in production, and it will be well to realise what this portends. There are those engaged in the industry who are of the opinion that all our products can be consumed locally, while others are equally emphatic that export of our surplus is the only alternative to stagnation and low prices. Fortunately such experience has been gained in the export of eggs as puts beyond doubt that it can be carried out profitably, and since the income from eggs is about seven-eighths of the total income from the industry, it is to the successful marketing of this product that we must look for stability. But while this is so at the present time, it by no means follows that the small returns now obtained from table poultry cannot be improved upon. This is a subject that will come up for consideration at the forthcoming conference to be held in October. In this connection it will be well if poultry-farmers will concentrate their attention on the problems that are confronting them, in the light of the fact that there is only one alternative to progress—that is stagnation. One thing is certain, the rate of expansion that is taking place cannot be maintained without export, but in this our industry is following what has been forced upon every other primary industry of any importance.

The Chicken Cockerel Problem.

All the portents are that inside of eight weeks from now the greatest glut of cockerel chickens yet experienced will take place, and that this will be the forerunner of low prices for table poultry all through the summer is only to be anticipated. That this matter is receiving some consideration is known, but unless that thought is translated into action very shortly it will be too late to avert trouble. However lightly the farmer might look upon one-eighth of the probable returns from his farm and treat it as a side issue, no modern business man will tolerate an avoidable loss even on a by-product; nor can poultry-farmers with their small returns afford to lose on any item of possible income.

Increase in Laying Stock.

Notwithstanding that there will be a large increase in laying stock in this State early next year, as a result of the increased hatchings, the outlook is improved by the fact that some other States, who have to some extent previously made New South Wales a dumping ground for their surplus, are now turning their attention to export overseas. The question of export *versus* local consumption can only be considered in the light of cost of production. The so-called law of supply and demand can only become operative where cost of production is low. If, for instance, the cost of feeding was on a low scale, eggs could be produced correspondingly cheaply, and doubtless local consumption would be stimulated as a result. But in an industry where roughly half the total cost of production is cost of feeding, as is the case with poultry, just as soon as the price of eggs falls below a certain point hundreds must be crushed out of the industry. Experience proves that cold storage and export are the safety valves, so to speak, that must be looked to as a means of keeping the industry on an even keel.

Cheaper Cost of Production.

Another means by which both local consumption and export might be stimulated is by lowering the cost of production. As already mentioned, to a large extent cost of production is governed by the price of poultry foods, but there are other ways by which the cost of production can be reduced. For some years past the cost of feeding has been such that an average of 12 dozen eggs per hen is necessary to give even a mediocre return to the farmer. More than a 12-dozen average is possible, but to obtain it a good deal of effort and skill is necessary. There are farmers obtaining an average of 14 dozen per hen, and their cost of feeding is not appreciably higher. When it is considered that the average wholesale price per dozen of eggs for the year is round about 1s. 9d., it will be seen that each dozen eggs produced over the 12 dozen adds 1s. 9d. to the income per hen. The extra two dozen shown to be possible means 3s. 6d. per hen, or if we deduct the odd 6d. for extra feed, the difference between the farmer who is producing 12 dozen and the one who produces 14 dozen, amounts to 3s. per hen, or £150 for 1,000 layers.

In this connection it should be remembered that such returns are not dependent upon any breeding for super egg-production. Such breeds as Leghorns, Orpingtons and Langshans, if well bred, well reared, and skilfully tended are capable of a 14-dozen average. Right now is the time of the year when these factors count, because first and foremost, we must have good strong breeding stock, and following that factor must come good rearing, because in the absence of good development the good breeding cannot function. Neither will one, or the other, or both, avail if not followed by skilful management and good environment. It means then, that, taking the breeds for what they are, the skill and aptitude of the farmer himself is the main factor in producing results—not so much somebody's laying strain.

Another thing that can pull down the returns from a farm is small eggs. Time was when an egg was an egg irrespective of size, but since grading is now insisted upon, each grade below the standard average of 2 ounces means a lower average price in proportion to the number of undersized eggs marketed. Taking the average yearly price of eggs at 1s. 9d., the lower grade can pull down that average by as much as 6d. per dozen for all undersized eggs. This is a very serious matter to the farmer who is getting a large proportion of such eggs. In such cases an increase in number of eggs laid would be necessary to offset the difference. Nor does the small-egg trouble end here. There is a more serious side still, which is that undersized eggs are a sure indication of degeneracy of the flock. There is only one way to insure keeping up size of eggs, and that is by close attention to all the factors already mentioned as being necessary to the production of good results.

What is Normal Good Development.

It is realised that it is one thing to advise that good development is necessary, but quite another for the average farmer to visualise that quality. Many farmers will go to no end of trouble and expense by way of bringing into their yards stock that they are persuaded will improve their results, but how many follow this up with close observation on the points brought out here? How many, for instance, get scales and weights to work during the rearing season to find out the class of development being obtained. Or how many know what weight constitutes good development at different ages? Yet this is more vital to their interest than many things that occupy attention. Weights of chickens have previously been dealt with in these notes as indicating development, but perhaps so far back as to be out of focus with many newcomers into the business. It is therefore permissible to repeat our remarks, or, what is better, to give new and up-to-date data on the subject.

Weights have been taken from time to time both at the Hawkesbury Agricultural College and at the Government Poultry Farm at Seven Hills, which on averages of flocks of fifty chickens and over, composed of equal

numbers of each sex, indicate that the following weights for age can be regarded as fair development for early to mid-season hatched chickens:—

White Leghorns.

Age.	Weight.			
28 days	6 to $6\frac{1}{2}$	ounces	average	per chicken.
42 „	12 to 13	„	„	„
84 „	32 to 36	„	„	„
160 „	48 to 56	„	„	„

Orpingtons or Langshans.

Age.	Weight.			
28 days	$6\frac{1}{2}$ to 7	ounces	average	per chicken.
42 „	13 to 14	„	„	„
84 „	48 to 56	„	„	„
160 „	64 to 72	„	„	„

These weights have sometimes been exceeded, particularly with early hatched chickens. Again, cockerels of all breeds will weigh heavier than the pullets, more particularly from six weeks onward.

Feeding.

The formula on which the chickens are fed is pretty generally known, but for the information of those who may not be acquainted with the ration fed it may be re-stated. The chickens are fed the first two days on rolled oats, such as is used for breakfast porridge. Following upon this, pollard and bran, to which is added bone meal (see formula below) mixed with skim milk into a crumbly mash, is fed throughout the day, while the last feed in chicken mixture. The number of feeds given per day ranges from five to three for the ages mentioned. No meat or meat concentrates are fed up to twelve weeks old. From that time on, the morning mash only is the same as for adult birds and contains 5 per cent. of M.I.B. meat meal.

Formula for Mash for Chickens.—Up to twelve weeks: One-third by weight of bran, two-thirds by weight of pollard, mixed with hot skim-milk, if procurable. One ounce of fine salt dissolved in the milk or water to every 5 lb. of ingredients to be mixed. Two feeds per day should contain 1 oz. M.I.B. bone meal to each 1 lb. of mash. There is no necessity to mix the mash more than twice per day.

Full instructions on feeding are published in a leaflet entitled "Rearing and Feeding Poultry," supplied gratis on application to the Under Secretary for Agriculture.

The writer has not so far advocated the use of meat concentrates, other than bone meal for chickens under 12 weeks of age, and has obtained satisfactory results in development with the aid of milk, the latter supplying the vitamine principle so necessary to the growth of the young. Experiments are, however, in progress with animal concentrates for which it is claimed that they supply the necessary elements at a cheaper rate than does milk. Whether or not they will prove to do so in actual growth and performance, remains for the experiments to determine.

Orchard Notes.

SEPTEMBER.

W. J. ALLEN and W. LE GAY BRERETON.

Cultivation.

THE treatment of the soil depends, of course, on its present condition and the climatic conditions of the locality, but the point to be remembered, and which must guide one's action in this respect, is that trees about this period are awakening into active growth and require a constant supply of moisture.

If the land has received an autumn ploughing and is still in a loose condition and free from weed growth, and thus in a condition to check evaporation and to catch and absorb any spring rains, cultivation of any sort may be postponed for a while, especially in the later and moist tableland districts. This has the advantage of allowing part, at any rate, of the trampling due to spring spraying to take place before the spring ploughing. If, on the other hand, the land has become trampled or compacted by heavy winter rains since the last ploughing and young weeds are starting, then it will need attention at once. In some cases the cultivator will be sufficient to put it into condition, and will thus enable the spring ploughing to be delayed till later for the reason given above. In other cases, perhaps, the land may be beyond the cultivator, and the plough will be needed at once.

Where green crops (whether sown crops or weeds) have been ploughed under during the winter, probably disc implements will be needed until the crop has rotted sufficiently to allow the use of tine cultivators or mould-board ploughs. A careful watch must be kept at this season on the soil, and the cultural scheme decided on must be carried out as soon as necessary. From this time onwards a good surface condition must be maintained throughout the summer months, so as to avoid needless loss of moisture by evaporation, either direct from the soil or through weeds.

Regular cultivation to maintain a loose soil mulch and to keep down weeds generally has to be started earlier in the hot dry inland districts than on the tablelands. Those parts immediately around the trees that cannot be reached by the plough or cultivator should be kept clear of weeds with hand tools.

Black Spot of Apple and Pear.

Some varieties, especially in the earlier districts, will be ready this month for the first application (spur-burst to pinking stage) of either lime-sulphur or Bordeaux mixture. Bordeaux mixture is undoubtedly the more efficient fungicide for this disease, but unfortunately it may russet the fruit more or less severely when applied after spur burst, and for some time after the setting period. So in districts where black spot is not very severe, or with varieties not very susceptible, it is preferable to depend on lime-sulphur.

Fortunately in some districts where apples and pears are grown in New South Wales, black spot occurs so rarely that no precautions need be taken against it.

Apple Mildew.

The first application of fungicide for this disease should be made at from spur-burst to pinking stages. In some localities lime-sulphur controls this disease, so that the applications for black spot also control mildew. But in many districts this is not the case, and some form of finely divided sulphur spray must be used, such as colloidal, atomic, or atomised sulphurs. These can be combined with lime-sulphur where necessary to treat for both diseases at one time.

Woolly Aphis.

Tobacco wash or nicotine sulphate can be combined with these applications of fungicide at the spur-burst to pinking stages, provided no soap has been used in making up the wash. Be careful that the correct proportion of both sprays to the total amount of liquid is maintained. If no fungicide is necessary at this period, the trees should receive tobacco wash or nicotine sulphate 40 per cent. to clean up the woolly aphis before the foliage is too dense.

Shot Hole and Scab of Apricot and Peach Freckle or Scab.

In some districts these diseases are very troublesome, and are not sufficiently controlled by the dormant application of fungicide. In some cases they should be sprayed with Bordeaux mixture, 6-4-50, when the petals are showing colour, but while they are still folded tight, and again just after setting. There is some danger of the application after setting causing defoliation, but if the soil is full of moisture and rain has been frequent defoliation is not likely to be severe enough to harm.

Peach and Cherry Aphis.

A close watch should be kept on peach, nectarine, apricot, Japanese plum, and cherry trees for aphis, which should be dealt with as soon as they appear and given no time to breed up. Tobacco wash or nicotine sulphate 40 per cent. are the best sprays at this season of the year, when the trees have started into growth. To be effective a high pressure must be used, and a drenching spray applied by holding the nozzle close to all affected parts, so as to break up the clusters of insects. Never forget that if any live aphis are showing within two to three days after first spraying, the dose must be repeated immediately. If longer time is allowed to elapse between the sprayings the pest will breed up as fast as it is being killed and will not be got under.

Codlin Moth.

Remember it is the carry-over grub from last season that causes all the trouble, so that if every means possible, as described by Mr. Broadfoot in the *Agricultural Gazette* of October, 1924, page 755, to reduce the carry-over, has not already been carried out, set to at once, or it will be too late.

The first application of lead arsenate is not made until the petals are falling and before the calyxes close. In our apple and pear districts this does not occur till October, but on parts of the coast some apples and pears blossom early and erratically.

Black Spot of the Grape.

Many of our grape districts have received too copious rains, and if the spring is not exceptionally dry black spot is sure to give trouble. Where growers have not swabbed with sulphuric acid and sulphate of iron they should spray with Bordeaux mixture (6-4-40), when the buds are well swollen.

In view of the fact that the acid and sulphate of iron treatment is disagreeable to the operator, is also sometimes severe on the vines, and must be applied as a swab unless a special pump is used, the Department has tested the substitution of spraying with Bordeaux mixture (6-4-40) when the buds are well swollen, and, though perhaps it would be unwise yet to assert that the Bordeaux treatment at this period is as effective as the acid sulphate of iron treatment, still there is sufficient evidence to recommend its use, if for any reason swabbing has been delayed and the vines are too far forward to swab without risk of injury. Moreover, the 6-4-40 Bordeaux can be applied, even if some of the buds have slightly shot. It may cause some scalding, but not sufficient to be really harmful. Of course, if weather conditions continue favourable to spot, either of the above initial treatments must be followed by frequent applications of Bordeaux mixture (6-4-50).

Downy Mildew.

There has not up to the present been an early outbreak of this disease in this State, and the comforting feature is that the applications of Bordeaux mixture for black spot would check an early outbreak of downy mildew if the right conditions did occur for its development early in the season. But what must be borne in mind is that grape vines are susceptible to downy mildew after the dangers of spot have passed, and one must continue applications of Bordeaux far nearer to ripening time than if spot only was feared. To avoid the marking of the fruit near ripening time Burgundy mixture (4-6-50), or one of the commercial Bordeaux or Burgundy powders, mixed as a spray, can be used in place of ordinary Bordeaux.

Oidium.

Dry flowers of sulphur when the shoots are 4 to 5 inches long, and at intervals later if weather conditions are favourable to the disease, is recommended.

It was an old belief that sulphuring when the vines are in blossom assists in the setting of the fruit, and from more than one quarter there has been evidence of late that this is the case. In very hot weather dry sulphur may

scald, and for this reason it is wise not to start the late applications too early in the morning when the summer has advanced, but to wait until it can be judged how the day will turn out.

Erinose.

Erinose, the name given to the blister-like condition of the foliage of vines which is caused by a tiny mite, has, generally speaking, caused more alarm up to the present than actual harm. The foliage apparently has been able to function normally, even when attacked. Departmental experiments have shown that thorough spraying with full winter strength lime-sulphur just before the vines shoot in the spring retards this pest sufficiently to control attack till late in the season, so that only the younger leaves at the end of the current year's canes are affected.

Leaflets on the diseases and on the preparation of the sprays mentioned above can be had on application to the Department of Agriculture; also Farmers' Bulletin No. 72, "Spraying." The former are free publications, and the price of the last is 1s. 1d., post free.

Planting.

In the early districts where there is a distinct spring in September and where normally danger of frosts is over, citrus trees should be planted now if the land is in suitable condition. Only well-grown young trees with healthy, well-developed roots, should be planted. It is a mistake to plant citrus trees deeply. In fact on the shallow coastal soils they should be planted very shallow, and the soil drawn up to them by ploughing up to the trees. A very important point is to firm the soil well in and around the roots, so as to have them in close contact with the soil. If the ground is over dry, a couple of kerosene cans of water should be poured into a basin round the trees, and when the water has soaked in, the basin should be filled in with dry soil.

Deciduous Trees.

As stated in previous notes, early planting for deciduous trees is advocated, but in cases where delays have occurred from various causes and the land is prepared and in good condition, kinds and varieties of deciduous fruit trees in late districts that have not started to shoot can still be planted during the early part of this month. A leaflet on laying out and planting may be obtained on application to the Department of Agriculture, Sydney.

Grafting.

Where it is desired to work over unsuitable varieties, top grafting can be carried out as soon as the sap is running. Apples and pears are far easier to top graft than the stone fruits, but if time permits the latter may be grafted, and where they fail to take shoots allowed to come from the stumps which can be budded later. A bulletin on budding and grafting may be obtained from the Department of Agriculture, price 10d., post free.

Pure Seed.

Growers Recommended by the Department.

The Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops, in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon, and (2) after a sample of the seed has been received by the Under Secretary and Director, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the prices for the seeds mentioned hereunder.

Maize:—	
Fitzroy	R. W. Hindmarsh, "Wiaraga," Bellingen.
	Manager, Experiment Farm, Grafton.
Ulmarra Whitecap	R. W. Hindmarsh, "Wiaraga," Bellingen
Leaming	Manager, Experiment Farm, Grafton.
Wellingrove	Manager, Experiment Farm, Glen Innes.
Golden Glow	W. McLeod, Logan House, Ben Lomond.
	J. F. Chick, Hill View, Tenterfield.
Fitzroy	F. W. Hill, Willowvale, Yarramalong.
Iowa Silvermine	R. Clifton, Farm 1,878, Griffith.
	H. Mallaby, Farm 1,864, Griffith.
Sweet Sorghums:—	
Collier	Manager, Experiment Farm, Grafton.
Early Amber Cane	Manager, Experiment Farm, Bathurst.
Honey	Under-Secretary. Dept. of Agriculture, Sydney
Saccaline	Manager, Experiment Farm, Lismore.
Selection, No. 34	Manager, Experiment Farm, Yanco.
Selection, No. 61	Manager, Experiment Farm, Grafton.
Grain Sorghums:—	
Milo	Manager, Experiment Farm, Cowra.
Feterita	Manager, Experiment Farm, Coonamble.
Manchu Kaoliang ...	Manager, Experiment Farm, Bathurst
Dual-purpose Sorghum:—	
Darso	Manager, Experiment Farm, Glen Innes.
Potatoes:—	
Carman No. 1	Moreton McDonald, Crookwell.
Coronation ..	E. M. Herring, "Sheen," Batlow.
Early Manhattan	K. Bowen, Springside, via Orange.
Surprise	Moreton McDonald, Crookwell.
Grasses:—	
Phalaris bulbosa	Col. H. F. White, "Baldblair," Guyra.
	Manager, Experiment Farm, Glen Innes.
Hooker's Fescue	Manager, Experiment Farm, Glen Innes.
Sudan Grass—	
Sudan Grass	Manager, Experiment Farm, Cowra.
	Manager, Experiment Farm, Temora.
	Manager, Experiment Farm, Nyngan.
	H. K. Nock, Nelungaloo.
	R. Wilson, North Logan, Billimari.

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

AGRICULTURAL SOCIETIES' SHOWS.

Secretaries are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 18th of the month previous to issue. Alterations of dates should be notified at once.

1925.

Society.	Secretary.	Date.
Ganmain A. and P. Association	C. C. Henderson	Sept. 15, 16
Holbrook P. and A. Society	J. S. Stewart	,, 15, 16
Junee P. A. and I. Association	G. W. Scrivener	,, 15, 16
Cowra P. A. and H. Association	E. D. Todhunter	,, 16, 17
West Wyalong P. A. H. and I. Association	T. A. Smith	,, 16, 17, 18
Northern A. Association (Singleton)	S. Griffits	,, 16, 17, 18
Murrumburrah P. A. and I. Association	W. Worner	,, 17, 18
Canowindra P. A. and H. Association	J. T. Rue	,, 22, 23
Lockhart A. and P. Society	E. D. Arnold	,, 22, 23
Wellington P. A. and H. Society	A. E. Rotton	,, 22, 23
Temora P. A. H. and I. Association	A. D. Ness	,, 22, 23, 24
Gunnedah P. A. and H. Association	M. C Tweedie	,, 22, 23, 24
Burrowa P. A. and H. Association	W. Burns	,, 29, 30
Henty P. and A. Society	J. Lovell	,, 29, 30
Barmedman A. and H. Society	T. P. Meagher	,, 30
Barellan P. A. and I. Society	H. H. Cuthbert	,, 30
Corowa P. A. and H. Society	J. D. Fraser	Oct. 2, 3
Hillston A. and P. Society	....	,, 2
Griffith A. Society	M. E. Sellin	,, 6, 7
Quandialla P. A. H. and I. Society	J E. Gardner	,, 7
Ardlethan A. Society	R. L. Neill	,, 7
Hay P. and A. Association	C. L. Lincolne	,, 7, 8
Narrandera P. and A. Association	W. H. Canton	,, 13, 14
Ariah Park A. Society	J. F. McInnes	,, 14
Carcoar H. C. and A. Society	T. J. Brady	,, 14
Millthorpe A. and P. Association	T. P. Smith	,, 20, 21
Deniliquin P. and A. Society	P. Fagan	,, 21
Coraki A. and H. Society	....	,, 28, 29
Nimbin A. and I. Society	G. R. Southwell	Nov. 11, 12
Lismore A. and I. Society	H. Pritchard	,, 17, 18, 19
Tweed River A. Society (Murwillumbah)	....	,, 25, 26
Orara River A. and H. Society (Coramba)	H. E. Hindmarsh	,, 25, 26
Quaker's Hill Agricultural Bureau	H. Trezise	Dec. 12

1926.

Society.	Secretary.	Date.
Albion Park A. and H. Association	H. R. Hobart	Jan. 1, 2
Dapto A. and H. Society	E. G. Coghlan	,, 15, 16
Kiama A. Society	G. A. Somerville	,, 26, 27
Wollongong A. H. and I. Association	W. J. Cochrane	,, 28, 29, 30
Mullumbimby A. and H. Association	....	,, 10, 11
Newcastle A. H. and I. Association	E. J. Dann	Feb. 23 to 27
Alstonville A. Society	W. J. Dunnett	,, 24, 25
Blacktown A. Society	J. McMurtrie	,, 26, 27
Tumut A. and P. Association	T. R. Wilkinson	Mar. 2, 3
Gloucester A. H. and P. Association	H. Watson	,, 2, 3
Bangalow A. and H. Association	....	,, 3, 4
Hunter River A. and H. Association (West Maitland)	M. A. Brown	,, 3, 4, 5, 6
Berrima A. H. and I. Society (Moss Vale)	W. Holt	,, 4, 5, 6
Nepean A. H. and I. Society (Penrith)	C. H. Fulton	,, 5, 6
Mudgee A P. H. and I. Association	J. H. Shaw	,, 9, 10, 11
Yass P. and A. Association	E. A. Hickey	,, 10, 11
Ulmarra P. and A. Society	....	,, 10, 11
Manning River A. and H. Association (Taree)	R. Plummer	,, 10, 11, 12
Campbelltown A. Society	W. N. Rudd	,, 12, 13
Rydal A. H. and P. Society	V. Bruce Prior	,, 19, 20
Royal Agricultural Society	G. C. Somerville	,, 29 to Ap. 7

[Later dates noted, but held over.]

Agricultural Gazette of New South Wales.

Seed Maize Contests.

LOWER NORTH COAST, 1924–25.

J. M. PITT, H.D.A., Senior Agricultural Instructor.

SEED maize contests for all varieties were again conducted on the Lower North Coast during the year. There were the main contest (fifth year), consisting of three plots, and a contest for Golden Superb (third year), consisting of one plot, conducted by the Macleay Agricultural Association; three plots in a main contest (sixth year), conducted by the Manning River District A.H. and I. Association (Taree); a plot of the Department's Hickory King (State-wide) contest at Wingham (the results of which will be published later); and a competition (the first) for all varieties, run under the auspices of the Mount George Agricultural Bureau, consisting of one plot at Mount George. Maize-growers were thus well catered for.

For the contest run by the Manning River Association, this association generously donates for competition annually two handsome cups, one to the owner of the highest average yielding variety, and the other to the grower of the highest yielding plot. These trophies are highly appreciated by those fortunate enough to win them. It is a way of recompensing in a small way men who have raised the Manning River district to the highest place among the maize-growing centres of the continent, and might well be adopted by other societies conducting these trials. Although the Mount George Bureau was unfortunate with its first attempt, it is pleasing to note that it, too, is recognising the value of the work, and is offering handsome trophies to the winning farmers.

The number of entries in all contests showed a slight falling off, due, no doubt, to the slump in the maize industry generally. The Macleay main competition attracted twenty-two entries, and the Golden Superb contest thirteen. On the Manning there were twenty entries in the main contest, eight in the Hickory King, and twenty-four in the Mount George competition. It is pleasing to note that several new competitors came forward in all contests. The quality of the seed sent in was mostly good. There were a few poor samples, chiefly sent along by newer competitors, and in one or two instances by farmers who have forwarded better lots for previous contests. These samples in almost every instance paid the penalty.

One had become so accustomed to Fitzroy and Large Red Hogan occupying first positions in these contests (they had won all between them previously), that it came as a mild surprise to find pride of place taken by Ulmarra Whitecap on the Macleay and Pride of Hawkesbury on the Manning. Both, of course, are recognised heavy yielding varieties, and they perhaps found a season just to their liking. Pride of Hawkesbury was first introduced to the Manning by the Department for the 1921-22 contests, after which some was procured by Mr. S. Flett. It was fourth in last season's Manning competition. The latest performance of yielding an average

of 131 bushels 9 lb. to the acre over three plots sown at various intervals eclipses all previous records, beating the previous best recorded in the 1921-22 contest (by Large Red Hogan) by over 10 bushels. Taking over six months to mature, it found the long drooping season and the rich alluvial soils very congenial. The cobs are enormous, both in length and girth measurements, and the yellow grain is very deep. It cannot be classed as a reliable variety, like Fitzroy, for instance, under all conditions, and as the cobs are somewhat coarse and the cores bordering on "firewood," it is not likely to become as popular as that variety. Furthermore, it is more subject to mould and other fungus diseases. The comparatively poor yield of Mr. Waters' entry of the variety was due to its being a shallower grain type.

The Taree Estate yield just fell short of the record for a plot yield, but every entry topped the 100-bushel mark.

Only three entries failed to reach the 100-bushel mark in average yield over three plots in the Manning competition.

Ulmarra Whitecap, the Macleay winner, hails from the Clarence River, and has long been recognised as one of the heaviest yielding main crop varieties suitable for the coastal rivers. Arriving too late as a Departmental entry for one of the previous competitions, the seed was handed to Mr. Duncan. So well did it yield for him that he entered it successfully in the present competition. He is practically the only grower of the variety on the river. The grain of Ulmarra Whitecap is very deep, and of a pale yellowish colour, with a still paler cap. The cobs average only about 9 inches long, but they are weighty, sound, and usually well filled. The average yield of 116 bushels 5 lb. is a record for the Macleay in the competitions.

Another feature of the main contests was the excellent performance put up by Leaming. Both in competition and on private fields the success of this variety this year has been most outstanding. To fill second and fourth positions on the Macleay with average yields of 113 and 108 bushels, with an individual yield of 134 bushels—the highest in the plot and the second highest in all contests in that district—and to average over 114 bushels to the acre for three plots on the Manning are very striking performances. The leading types of the variety this season are remarkable for their long, well-filled cob, and very deep, heavy grain.

In the Golden Superb contest, the previous record of 105 bushels 18 lb., put up in the first contest, was beaten, both Mr. Jeffery's and Mr. R. Kesby's entries excelling that figure. It is a coincidence that Messrs. C. Kesby and Alb. Jeffery finished in that order in the first contest.

The Manning.

Three plots were selected for the contest, the farmers who competed last year again generously offering their land and services.

Rather droughty conditions, accompanied by cold westerly winds, prevailed during the late winter and early spring months. Late October was marked by a complete break of the drought, very heavy rainfalls being

registered in November and December. A heavy windstorm in December broke off a number of stalks in all three plots, reducing the yield. Useful falls occurred in January, but the latter part of this month and early February were marked by a dry spell. Heavy rain fell again, however, during the autumn months. It can hardly be wondered that under such favourable conditions good yields were recorded. For the class of country where the Oxley Island plot was sown rather too much rain fell. The land being low-lying and the soil of less depth than on the other plots, the early growth of the crop was marked by yellowness and patchiness.

The rainfall at Taree was as follows:—

1924.	Points.	1925.	Points.
September	233	January	366
October	139	February	151
November	732	March	456
December	710	April	346

As in previous contests, four grains were hand-dropped 3 feet apart in drills 4 feet apart. Measured tapes were used to ensure each entry having the same number of grains dropped at the same distances throughout.

MANNING River Maize Competition.

Competitor.	Variety.	W. Macdonald, Taree Estate.		W. Ryan, Oxley Is.		J. P. Mooney, Dumaresq Is.		Average Yield per acre.	
		bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.
S. Flett	Pride of Hawkesbury ...	143	4	118	42	131	32	131	9
J. P. Mooney ...	Fitzroy No. 2	121	45	104	52	142	48	123	11
J. P. Mooney ...	Fitzroy No. 1	117	9	124	36	118	31	120	5
W. H. MacDonald ...	Large Red Hogan ...	136	17	93	25	115	28	115	4
W. Ryan	Leaming	121	42	110	11	112	2	114	37
W. H. MacDonald ...	Golden Beauty ...	113	12	102	18	120	20	112	0
Dempsey Bros. ...	Pride of Hawkesbury ...	123	51	86	30	122	39	111	2
H. G. Smart ...	Manning Silvermine ...	121	0	109	51	98	30	109	45
A. M. Hooke ...	Golden Beauty ...	123	16	98	30	106	3	109	27
F. Waters (Kempsey)	Fitzroy	114	51	106	12	99	32	106	48
G. Levick	Large Red Hogan ...	126	1	81	25	111	12	106	12
W. H. MacDonald ...	Manning Silvermine ...	100	30	113	12	98	23	104	3
E. J. Gill	Large Red Hogan ...	109	27	92	14	108	40	103	30
E. J. Gill	Funk's Yellow Dent ...	118	17	102	18	85	47	102	8
H. E. Smart ...	Woodside Dent ...	124	4	88	17	93	53	101	5
A. M. Hooke ...	Fitzroy	117	7	82	28	103	22	101	0
H. Flett	Fitzroy	115	15	83	20	101	20	100	0
E. J. Gill	Fitzroy	109	25	91	50	83	12	94	47
Jas. Stitt	Large Yellow Horse-tooth.	111	38	62	39	107	26	93	53
F. Waters (Kempsey)	Pride of Hawkesbury ...	103	40	74	12	100	44	93	4

Average yield per acre—Taree Estate, 118 bus. 33 lb.; Oxley Island, 96 bus. 21 lb.; Dumaresq Island, 108 bus. 5 lb.

Mr. W. MacDonald's plot at Taree Estate was sown on a rich alluvial piece of soil, previously cropped to potatoes. A good early preparation of the soil was given, consisting of a deep disc ploughing and harrowing in July, followed by similar treatment in August and again prior to sowing.

This preparation brought the soil to an excellent tilth. Sowing took place on 11th September, superphosphate at the rate of 1½ cwt. to the acre being applied in the drills by the dropper prior to sowing. The drills were filled in by the cultivator. An excellent germination took place. Early growth was somewhat checked by the weather conditions, but this had a beneficial effect on the crop, it having been proved beyond doubt that maize always does better where the growth is somewhat checked prior to tasselling. The plot was cultivated at intervals, Mr. MacDonald being a firm believer in keeping the soil loose on top and free from weeds. Choosing a suitable day, the crop was again cultivated when breaking in tassel. This procedure, unless done by a careful hand, is always accompanied by risk; there is the possibility of breaking off stalks, and cultivating too deeply destroys the root growth, the surface soil at that period being well charged. The maize harvested from this plot was probably the cleanest and soundest recorded from any competition, a noteworthy feature considering the extremely damp season.

For the Oxley Island plot Mr. W. Ryan broke up during the previous autumn a paddock that had been under pasture for twenty years. The soil was of a loamy nature. Two mouldboard ploughings and one disc were given in March, each followed by two harrowings. The field was sown to oats and fed off in July, after which the land was prepared for sowing the maize, two ploughings and two harrowings being given. The plot was sown on 19th September. Superphosphate at the rate of 1 cwt. to the acre was applied in the drills before sowing. The drills were covered by turning back a furrow, the ground being too rough for the use of the cultivator. Germination was fair to good. Continuous rain waterlogged the soil in November and December. The crop became yellowish and patchy, but recovered a little during January and February. The yields were somewhat variable, but the final result was not influenced. There was a considerable number of mouldy cobs.

The Dumaresq Island plot was situated on a rich loamy soil that had grown maize and potatoes for a few years previously. Mr. Mooney had prepared a good seed-bed. The plot was sown on 3rd October. Fertiliser at the rate of 1½ cwt. was applied to the drills with the maize dropper, and the plot had a further manuring by the application of nitrate of soda, spread along the drills at the rate of ¾ cwt. to the acre during the early stages of growth. The crop grew well throughout, attaining a height of 14 to 15 feet. As on the other plots, a number of the largest stalks were broken off by the December windstorm. Late varieties yielded best. The sample of maize compared unfavourably with that at Mr. MacDonald's, as it showed variable amounts of mould. This was probably due to the lateness of sowing and consequent later ripening.

The filling of the minor leading positions by Fitzroy and Large Red Hogan again shows the consistently high yielding capabilities of these varieties. Mr. Mooney's No. 1 seed was from an ordinary seed plot of Fitzroy. No. 2 was from a plot in which introduced seed of Fitzroy had been mixed with the farmer's strain, this cross within the variety, it is

believed, helping to restore vitality, which is lost where inbreeding takes place as in No. 1 plot. No. 2 seed had also yielded better than No. 1 in private trials.

The Macleay.

Three plots were selected on this river, Messrs. Duncan and Steane again generously offering land and services. The third plot was selected on Mr. F. H. Ducat's property at Temagog, one of the oldest maize centres of the Upper Macleay. It was in this neighbourhood that much of the maize that has made the Macleay famous in years gone by was produced by those well-known Macleay men, Messrs. John Booth and Albert Jeffery. That the soils here lack nothing in fertility is shown by the excellent plot turned out by Mr. Ducat, a record for the Macleay, in the face of many adverse circumstances, at the first attempt.

Acting on the belief that the usual distance of sowing (4.4.3) was not the best as far as the Macleay was concerned, the maize committee decided by majority that a little thicker planting would be advantageous, and drills 3 feet 9 inches apart with four grains every 2 feet 9 inches was agreed to. The wisdom of making the distances closer is open to doubt, and these measurements are not likely to be adhered to by the majority of growers in the district, who mostly plant wider than the measurements of previous contests. In a very wet year there is always the possibility, through the absence of sufficient sunlight, of encouraging tall, spindly growth, hence reduced vitality and a susceptibility to disease—this was, in the writer's opinion, to a certain degree instanced during the past season. Again, in a droughty season too close planting means decreased yield.

Somewhat similar conditions prevailed here as on the Manning—droughty and cold conditions during early spring, with a general break of the drought in late October, continuous rains in November and December, a slackening off in January and February, then more heavy registrations in the autumn. A heavy windstorm in December broke down several stalks in the Smithtown plot, and seriously damaged an exposed section of the Temagog plot, so much so that one lot of Large Red Hogan was hopeless, and two others (the same variety) suffered so heavily that any chance they had of occupying leading positions was spoilt. The rainfall at Kempsey was as follows:—

1924.	Points.	1925.	Points.
September	164	January	284
October...	179	February	385
November	597	March	769
December	322	April	248

The Smithtown plot was sown on the same land as last year's contest. Prior to that crop the land had been under pasture for many years. The soil was in good tilth for sowing on 9th September. Germination was patchy, owing probably to the cold conditions prevailing. Grubs were prevalent in the early stages and thinned the plots. Subsequent rain and warmth induced a rapid sappy growth. Only two cultivations were possible, the damp conditions preventing any more. There were a number of mouldy cobs, as was only to be expected under the conditions.

The soil at Temagog is a rich alluvial loam. Where the plot was sown had grown maize previously for many years. In this neighbourhood the best results are obtainable only with very early sowing, and Mr. Ducat considers the plot (sown 9th October, nearly seven weeks too late) badly handicapped from the start. This was unavoidable under the circumstances. Again, the season turned favourable almost immediately, resulting in a tall, somewhat spindly-looking, growth. The drier conditions in January and February improved matters, but the crop carried a number of barren and five-fingered stalks. The wonder is it yielded so well under such adversities. No fertiliser was used. Several cultivations were given. There were odd mouldy and otherwise spoilt cobs in the late varieties.

MACLEAY River Maize Competition.

Competitor.	Variety.	D. Duncan, Smithtown.		F. H. Ducat, Temagog.		Average Yield per acre.	
		bus.	lb.	bus.	lb.	bus.	lb.
D. Duncan	Ulmarra Whitecap ...	111	31	120	34	116	5
S. Flett (Taree) ...	Leaming	92	34	134	20	113	27
G. Booth	Yellow Hogan	88	20	130	20	109	20
R. Lindsay	Leaming	91	32	125	32	108	32
J. P. Mooney ...	Fitzroy	94	39	121	12	107	53
H. Wheeldon ...	Golden Beauty ...	100	18	114	9	107	13
J. Booth	Large Red Hogan ...	85	42	123	10	104	27
Brown and O'Shea ...	Fitzroy	84	53	121	33	103	10
E. H. Ducat... ...	,, ...	94	24	111	13	102	44
F. Waters	,, ...	88	54	112	8	100	31
A. M. Hooke (Taree)	Golden Beauty ...	91	40	108	32	100	8
D. Dornan	Yellow Hogan	96	11	102	44	99	27
A. Jeffery	Hawkesbury Hogan ...	86	53	107	18	97	7
P. Waters	Pride of Hawkesbury	90	20	96	11	93	15
F. H. Ducat ...	Large Yellow Horsetooth	74	28	107	44	91	8
S. Flett (Taree) ...	Pride of Hawkesbury	86	26	94	43	90	35
C. J. O'Shea... ...	Yellow Hogan	86	54	93	19	90	9
W. J. Seargent ...	Leaming	78	16	96	16	87	16
G. Levick (Taree) ...	Large Red Hogan ...	81	40	83	10	82	25
J. Booth	Silvermine	66	11	92	55	79	19
P. G. Griffin ...	Coodra Vale	65	9	90	20	77	42
L. Wheeldon ...	Large Red Hogan ...	71	42	....		....	

Average yield per acre at Smithtown 86 bus. 44 lb.; Temagog (21 plots), 108 bus. 53

The Greenhills plot was on the Euroka Flats, on soil of a fairly heavy loamy nature. Maize had been grown on the plot for a number of years previously. The first ploughing was given in July, followed by a harrowing, a rolling, and another harrowing. The plot was then left until the latter end of September, when it was again ploughed, harrowed, rolled, and harrowed twice again to break down clods. The plot was sown on 16th October. The surface soil was fairly loose, but the under surface rather firm, owing probably to the operations following the second ploughing. Germination was fairly good. Early growth was slow, owing to the cold conditions. The plot received a heavy drenching with the November and December rainfalls. Owing to the waterlogging of the soil and the absence of sunshine, the plot when inspected in December was yellowish, and a certain amount of leaf rust was present. Although it had a better colour

when seen in February, the growth was still weak-looking. Later it was noticed there were a number of barren stalks. Faced with the possibility of inaccurate yields, conveying rather a wrong impression of the capabilities of some of the varieties and of the neighbourhood, it was reluctantly decided to abandon the plot.

Omitting Ulmarra Whitecap and Leaming, which have been described elsewhere, the outstanding yields were those of Mr. Booth's Yellow Hogan (which appears to do best on the sweeter upriver soils of the Macleay) and four lots of Fitzroy. The yields from these were consistent with the varieties' previous good performances; all averaged between the 100 and 109-bushel mark. The yields of Mr. Booth's Large Red Hogan were considerably decreased by cobs lost in lodging. Its place under better conditions should have been higher up the list. Coodra Vale, by its succession of failures, might well be excluded as an undesirable variety for the district.

Golden Superb Contest.

The third annual competition for this variety was sown at Mr. D. Duncan's farm on 9th September, on a fertile loamy soil. Four grains were dropped 2 feet 3 inches apart in drills 3 feet 6 inches apart, Golden Superb, on account of its sparseness of foliage and rather thin stalk growth, lending itself admirably to close planting. This early-maturing variety has been grown extensively on the Macleay for many years, and through the yielding contests its qualities are becoming appreciated elsewhere in New South Wales and in Victoria and Queensland. Although it has not yielded perhaps quite as heavily as one or two other early-maturing varieties in farmers' trials, it certainly has other outstanding features. It is not so readily attacked by weevil (although far from immune), it is a good yielder, the tiniest of the cobs being well filled with grain, and the weight per bushel measure exceeds that of any other early variety; further, it stands a droughty spell, invariably giving some returns under the severest conditions. Of recent years, chiefly on account of haphazard methods of growing and selecting the seed, and the introduction of and interpollination with longer maturing kinds, it has to a certain degree lost one of the characteristics that made it such a valuable variety, viz., early maturity. As a result, instead of grain reaching the early market in December and January, as formerly, very few consignments are now mature enough for sale before the end of January. For the same reason farmers are somewhat delayed in preparing their land for early winter fodders.

The object of the contest is to bring to light the most desirable types, namely, those combining heavy yielding capabilities with early maturity. The quality of the maize sent in for sowing and the yields have certainly improved since the inauguration of the contests, but in the majority of the entries the growing season is still from two to three weeks later than old-time strains of Golden Superb. However, by securing the earliest maturing sorts, the yields of which are at present lower than the later types, and improving them by rotation and selection, much can be done to restore the desirable feature of earliness.

The season was a good one for the variety, a checked early growth being followed by good conditions during the tasselling stages. Probably the best samples sent along were those of Messrs. J. Skimmings, C. Kesby, W. H. MacMahon, A. Thornton, J. Booth, and A. Jeffery. Of Mr. Booth's two samples, No. 1 was a large deep and heavy grain, and slightly earlier than No. 2, which was a shallower grain and paler in colour. Those of Messrs. J. Skimmings, junior, C. Kesby, J. Booth, and W. H. MacMahon were the best samples in the harvested grain.

YIELDS in Golden Superb Contest.

Competitor.	Yield per acre.		Period of Maturity.
	bus.	lb.	
1. A. Jeffery	116	20	10 days later than Nos. 10 and 12.
2. R. Kesby	109	24	2½ weeks later than Nos. 10 and 12.
3. G. Skimmings	101	2	10 days later than Nos. 10 and 12.
4. W. H. MacMahon	99	19	10 " " "
4. J. S. Skimmings, jun.	99	19	10 " " "
6. A. J. Shea	95	54	10 " " "
7. J. Booth, (No. 1)	94	16	5 " " "
7. F. H. Ducat	94	16	5 " " "
9. A. M. Hooke (Taree)	85	49	10 " " "
10. C. Kesby	84	10	Earliest.
11. J. Booth (No. 2)	80	46	10 days later than Nos. 10 and 12.
12. A. Thornton	79	7	Earliest.
13. H. Wheeldon	63	55	5 days later than Nos. 10 and 12.

Upper Manning Contest.

Mt. George Agricultural Bureau.

The decision of this branch of the Bureau, although rather late in the year, to run an annual maize competition, in which there are offered handsome trophies, will do much to stimulate interest in maize-growing in these parts. As it was not really until late October that a start was made, only one plot was available—that owned by Mr. H. Andrews, Charity Creek. The contest attracted twenty-four entries, a very encouraging response under the circumstances.

The soil in this neighbourhood is among the most fertile on the Manning, and a fine seed-bed was prepared for sowing on 20th November. Germination was hampered a little by a severe storm at the completion of the sowing. Growth continued rapidly throughout, and the crop promised well, until a very severe local windstorm, with rain, so battered the plot about that it would have been impossible to get anything like accurate yields. Consequently the contest was abandoned for the year—an unfortunate ending. Among the entries were:—Large Red Hogan, Narrow Red Hogan, Yellow Hogan, Yellow Horsetooth, Golden Beauty (3), Fitzroy (3), two strains of Fitzroy (Somerset and Woodside Dent), Leaming (3), Silvermine (3), Manning Pride (3), Golden Nugget, Coodra Vale, and Pride of Hawkesbury.

Varieties of Maize.

Recommendations by the Department of Agriculture.

The list of varieties of maize recommended by the Department for various districts is periodically revised as the result of experiments carried out throughout the State. The following are the latest recommendations:—

Approximate Order of Maturity of Varieties Recommended.

Extremely Early.—Sundown.

Very Early.—Early Morn, Golden Glow.

Early.—Wellingrove, Gold Coin, Golden Superb, Kennedy, Golden Surprise, Iowa Silvermine, Funk's Yellow Dent, Iowa Goldmine, New England Whitetip, Auburn Vale, Craig Mitchell.

Midseason.—Hickory King, Boone County White, Leaming, Coodra Vale, Golden Nugget, Early Clarence, Golden Beauty, Narrow Red Hogan.

Late.—Yellow Hogan, Fitzroy, Large Red Hogan, Yellow Moruya, Ulmarra Whitecap.

Varieties Recommended for Grain.

Upper North Coast.

(*a*) *Tweed River.*

Early Crop.—Leaming, Craig Mitchell, Iowa Silvermine.

Main Crop.—Fitzroy, Ulmarra Whitecap, Large Red Hogan (for early sowing only).

(*b*) *Lower Richmond River.*

Early Crop.—Hickory King (second-class soils only), Leaming.

Main Crop.—Golden Nugget (second-class soils only), Fitzroy.

(*c*) *Upper Richmond River.*

Early Crop.—Leaming, Boone County White.

Main Crop.—Fitzroy, Large Red Hogan, Ulmarra Whitecap.

(*d*) *Clarence River.*

Early Crop.—Leaming.

Main Crop.—Fitzroy, Ulmarra Whitecap.

Second-class Soils.—Golden Nugget, Hickory King.

(*e*) *Bellinger River.*

Early Crop.—Leaming, Iowa Silvermine.

Main Crop.—Fitzroy, Ulmarra Whitecap.

North Coast Tablelands.

Dorrigo and Comboyne Districts.

Main Crop.—Leaming, Golden Superb, Golden Nugget.

MIDDLE NORTH COAST.

(*a*) *Nambucca River.*

Early Crop.—Golden Superb, Leaming.
Main Crop.—Fitzroy, Yellow Hogan.

(*b*) *Lower Macleay River.*

Early Crop.—Funk's Yellow Dent, Golden Superb.
Main Crop.—Fitzroy, Large Red Hogan, Yellow Hogan, Golden Beauty.

(*c*) *Upper Macleay River.*

Early Crop.—Golden Superb, Funk's Yellow Dent.
Main Crop.—Large Red Hogan, Fitzroy, Yellow Hogan.

(*d*) *Hastings River.*

Early Crop.—Funk's Yellow Dent, Craig Mitchell.
Main Crop.—Fitzroy, Large Red Hogan, Golden Beauty.

(*e*) *Lower Manning River.*

Early Crop.—Funk's Yellow Dent, Craig Mitchell.
Main Crop.—Fitzroy, Large Red Hogan, Yellow Hogan, Pride of Hawkesbury.

(*f*) *Upper Manning River.*

Early Crop.—Golden Superb, Funk's Yellow Dent, Iowa Silvermine, Craig Mitchell.
Main Crop.—Fitzroy, Leaming, Golden Beauty, Yellow Hogan.

CENTRAL COAST.

(*a*) *Lower Hunter River.*

Early Crop.—Funk's Yellow Dent, Craig Mitchell.
Main Crop.—Large Red Hogan, Fitzroy

(*b*) *Hawkesbury River.*

Early Crop.—Golden Superb.
Main Crop.—Large Red Hogan, Fitzroy.

(*c*) *County Cumberland.*

Early Crop.—Hickory King.
Main Crop.—Fitzroy.

SOUTH COAST.

(*a*) *Illawarra District.*

Early Crop.—Funk's Yellow Dent, Iowa Goldmine, Iowa Silvermine, Craig Mitchell.
Main Crop.—Large Red Hogan, Fitzroy, Yellow Hogan.

(*b*) *Shoalhaven River.*

Early Crop.—Funk's Yellow Dent, Boone County White.
Main Crop.—Leaming, Funk's Yellow Dent, Fitzroy, Boone County White.

(c) Milton District.

Early Crop.—**Funk's Yellow Dent, Boone County White, Iowa Goldmine, Iowa Silvermine.**

Main Crop.—**Fitzroy, Large Red Hogan, Leaming.**

(d) Moruya River.

Early Crop.—**Funk's Yellow Dent, Boone County White.**

Main Crop.—Large Red Hogan, Yellow Moruya.

(e) Beya River.

Early Crop.—Funk's Yellow Dent, Boone County White, Iowa Goldmine, Iowa Silvermine.

Main Crop.—Large Red Hogan, Yellow Moruya, Golden Beauty.

NORTHERN TABLELAND.

(a) Tenterfield District.

Wellingrove, Funk's Yellow Dent, Golden Glow, Iowa Silvermine.

(b) Glen Innes District.

Strong Soils.—Wellingrove, Iowa Goldmine, New England Whitetip, Funk's Yellow Dent.

Light Soils.—Wellingrove, Iowa Silvermine.

(c) Ben Lomond, Llangothlin, Guyra, and Black Mountain Districts.

Sundown (on good fertile soils only), Early Morn, Golden Glow.

(d) Armidale District.

Funk's Yellow Dent, Wellingrove, Golden Glow, Gold Coin, Golden Superb.

(e) Uralla District.

Wellingrove.

CENTRAL TABLELAND.

(a) Bathurst District.

Alluvial Soils.—Funk's Yellow Dent, Iowa Silvermine.

Upland Soils.—Iowa Silvermine.

(b) Colder Districts.

Sundown (on good fertile soils only), Early Morn.

SOUTHERN TABLELAND.

Moss Vale District.

Golden Glow.

NORTH-WESTERN SLOPES.

(a) Inverell District.

Funk's Yellow Dent, Iowa Silvermine, Wellingrove, Kennedy, Auburn Vale.

(b) Tamworth and Upper Hunter Districts.

Alluvial Soils.—Funk's Yellow Dent, Iowa Silvermine.

CENTRAL-WESTERN SLOPES.

Alluvial Soils.—Funk's Yellow Dent, Iowa Silvermine.

Upland Soils.—Iowa Silvermine, Early Morn.

SOUTH-WESTERN SLOPES.

(*a*) *Tumut River.*

Rich Alluvial Flats.—*Main Crop* (October sowing), Early Clarence; *Early Maize* (late sowing), Funk's Yellow Dent, Craig Mitchell, Golden Surprise.

Second class Alluvials.—Funk's Yellow Dent, Iowa Silvermine.

(*b*) *Murrumbidgee River* (*Gundagai District*).

Funk's Yellow Dent, Coodra Vale, Iowa Silvermine.

MURRUMBIDGEE IRRIGATION AREAS.

Funk's Yellow Dent, Iowa Silvermine.

Varieties Recommended for Green Fodder.

COASTAL DISTRICTS.

Early Varieties.—Hickory King, Leaming, Boone County White.

Late Varieties.—Fitzroy, Pride of Hawkesbury, Ulmarra Whitecap, Whitecap Horsetooth.

TABLELAND DISTRICTS.

For Warmer Districts.—Fitzroy.

For Cooler Districts.—Hickory King, Leaming.

For Coldest Districts.—Wellingrove.

WESTERN SLOPES AND MURRUMBIDGEE IRRIGATION AREAS.

Fitzroy.

WHAT A STACK OF SILAGE DID.

IN an interesting communication to the Department, Mr. J. J. Barnes, Jamberoo, relates his success with stack silage in the past season. The stack, which was built inside a framework of poles, as suggested in the *Agricultural Gazette* in November, 1919, contained about 30 tons of fodder, including maize and summer grass, elephant grass and paspalum, and some Planter's Friend. In feeding it out, Mr. Barnes started lightly, mixing it with chaffed dry Planter's Friend, which had been frosted, and of which the cows had refused to eat half a feed. The cattle soon developed a taste for the mixture of silage and dry "Planter," and began to put on condition and to improve in the milk yield. The young calves could hardly be kept away from the silage, and some of the horses nearly lived on it. "Only those who have ensilage to mix with their dry feed know the value of it," is Mr. Barnes' testimony.

Farmers' Experiment Plots.

MAIZE TRIALS, 1924–25.

Northern District.

MARK H. REYNOLDS, H.D.A., Senior Agricultural Instructor.

THE following farmers co-operated with the Department in experiments with maize last season:—

J. and L. Chick, Tenterfield.
W. G. Geyer and Sons, Tenterfield.
J. Simmons and Son, Armidale.
J. Monkley and Son, Redbourneberry.
A. R. Brooks, Baerami.

The seasonal conditions were notable for the excessive rains during early summer. This restricted cultivation and enabled weeds to become firmly established. In many instances where seeding had not been prevented in past seasons, the maize fields were a mass of weeds, chiefly *Amaranthus peniculatus,* commonly known as Boggabri or red leg. This weediness materially reduced the yield. Cob rot, due to a Fusarium species of fungus, was prevalent to a minor extent throughout the district, encouraged possibly by the wet conditions. As this fungus causes both stem and root rot, growers are advised to reduce the risk of attack by rotation. Apart from this disease, the maize crops were generally healthy, the cobs well filled, and the grain of good quality.

Some very fine crops were garnered at Tenterfield, yields up to 90 bushels per acre being obtained from the deep alluvial soils on creek frontages. Even on the red sandy granitic uplands, where rotation and good cultivation had been practised good yields were obtained.

The price of maize this season is low (3s. to 4s. per bushel), but the climatic conditions in the tablelands country, from Walcha to Tenterfield, are favourable to storage, as the grain dries well, and is not attacked by weevil or moth to any extent, and is often not at all affected.

Details of the Plots.

Redbourneberry.—Deep alluvial sedimentary black loam; previous crop, pumpkins in 1923, unmanured. Disc-ploughed 8 to 9 inches deep in August, when a heavy crop of crowfoot was turned under; rolled; again ploughed early in September 6 to 7 inches deep with a mouldboard plough (at this time the crowfoot was rotted); harrowed after each ploughing; twice tine-cultivated, on the first occasion 8 inches deep and the second 3 to 4 inches deep; harrowed after each tine-working; harrowed just prior to sowing.

Plough drills opened and four grains dropped every 3 feet to permit of subsequent thinning out if necessary so as to leave three sturdy plants; seed covered by harrows; land twice cultivated between the rows of corn.

The good cultural condition, aided by ample rainfall during the early period of growth, induced tall stem growth. Want of moisture and dry winds at tasselling caused small cob formation. All varieties were satisfactory as to type except Silverblend, which is an unfixed crossbred, and hence of uncertain capacity. The maize was remarkably free from any disease.

Armidale.—Country sloping gently from west to east; black clay loam, self-mulching, of basaltic origin. Skinless barley (unmanured) in 1923 yielded about 23 bushels per acre. The land was scarified shortly after harvesting the barley, a self-sown crop of which appeared in the early autumn. This was kept close cropped by turning sheep on to it from time to time until July. Cultural operations for the experiment consisted of 4 to 5 inch ploughing during July, a harrowing one month later, and in September a cultivation with a set-tine cultivator working at plough depth. For sowing (on 10th October) drills were opened out with a plough 4 inches deep and 3 feet 8 inches apart. The grain was dropped by hand, three grains every 3 feet apart. No fertiliser was applied.

RESULTS of Variety Trial.

Variety.	Redbourneberry.	Armidale.	Tenterfield (W. G. Geyer and Sons).	Baerami.
	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Silverblend ...	61 33	......	... ..	......
Iowa Silvermine ...	59 0	......	26 32	29
Morris' Golden Superb ...	50 0	.....	.. ...	......
Goldmine ...	43 0	48 43	22 38	... ..
Leggett's Pride	47 15	. ...	. ..	.. ...
Wellingrove	46 32	42 18	27 0	29 28
Golden Glow	43 0	31 20	19 0	29 0
Funk's Yellow Dent	62 11	53 20	.	Failed
Silver King ..	......	.....	26 5	. ..
Hickory King	......	... .	28 45	....
Golden Superb ...	......	59 0	20 31	.. ...
Wild's Yellow Dent	.....	62 41	......	......
Parson's Yellow Dent	. ..	52 0	...	.....
Shannonvale ...	..	45 30	... .	...
Gold Coin ...	.	47 18	. .	.....
Bailey ...		38 16	......	... ..
Early Morn. ...	... .	. ....	...	30 0
Auburn Vale Hogan ...	..	...	. . .	22 0

The soil was in good tilth and the moisture content good, and a good stand resulted. The wet conditions during the early growth made harrowing of the crop to destroy weeds inadvisable. Four cultivations were subsequently given between the rows, and the odd weeds remaining were hoed out by hand. The plot and the adjoining crop of maize constituted one

of the cleanest maize fields in the district, and a vigorous and prolific growth was the result of the cultivation and freedom from weeds. Inspection on 30th January, 112 days from sowing, showed Funk's Yellow Dent (the shortest) to be 3 to 4 feet high, and Shannonvale (tallest) 5 feet high. The most mature at this time were Bailey and Golden Glow (in which the silks were showing), then Wellingrove, with Wild's Yellow Dent earlier than Funk's Yellow Dent, which was the latest maturing variety. In the opinion of Mr. Wenholz, of the Department, Wild's Yellow Dent is a cross between Funk's Yellow Dent and Wellingrove. Golden Glow was the outside variety in the plots, adjoining a barley crop, with a cultivated strip between, and the outside row materially reduced the yield. Golden Glow and Bailey matured about three weeks earlier than any other variety, and grew to 5 feet high, the rest attaining a height of 7 feet. On 13th May, Golden Glow, Bailey, Wellingrove, and Golden Superb were fit to thresh. The quality of all varieties was good and the cobs well filled. Funk's Yellow Dent is considered too late maturing. In Gold Coin the grain matured unevenly. A cross section of all varieties was on a somewhat level low-lying situation, and the yield was materially below that on the higher and more sloping section.

Tenterfield (J. and L. Chick).—Maize manurial plots, located on creek frontage where the soil is a deep black loam of good fertility. The land was enriched some years ago by the addition of blood manure from the local meat works. It was cropped up to nine years ago, since when it had been to pasture (mainly couch) up to the breaking of the sod for the trial. Ploughed 3 inches deep 2nd July, harrowed 16th July, ploughed 8 inches deep and harrowed 2nd August, springtooth cultivated 4 to 5 inches deep, 20th October; drills opened out with plough 4 inches deep, 3 feet 9 inches apart, and three grains dropped every 3 feet, and covered by harrows directly after sowing (on 22nd October). Weeds were kept under control by inter-row cultivations on 20th November and 2nd December. The wet conditions later enabled the couch especially to spread, but not sufficiently to affect the crop materially.

Tenterfield (W. G. Geyer and Sons).—Variety trial, situated on sloping uplands; red to grey sandy loam of granitic origin. Cropped with maize (manured with 112 lb. M12, per acre) in 1922. Oats were sown in the autumn of 1923 and fed off until the spring, when the land was ploughed and cultivated. Sown with maize the latter part of December. Both the oat and maize crops were unmanured. The maize crop yielded poorly, the best being on the portion dressed with M12 in 1922. Ploughed 7 to 8 inches deep latter part of August, harrowed one week later, and springtooth cultivated 3 inches deep just prior to seeding. Drills ploughed 4 inches deep and four grains dropped every 3 feet in the drills, rows about 4 feet apart. Later where necessary the plants were thinned out to three every 3 feet. The plots were unmanured. On another section the grain was machine sown with single grains about 15 inches apart. A duplicate plot was sown with an application of 124 lb. M12, per acre. This section was abandoned owing to damage from partial waterlogging from the excessive rains.

The plot was harrowed after sowing and an inter-row cultivation given early in December. All varieties matured good quality grain on well-filled cobs. A few mouldy cobs, affected by a Fusarium type of fungus, were noticed in all varieties. The area on which single grains had been planted 15 inches apart yielded 3½ bushels per acre more than the other. The same method showed an increase in 1922.

Rainfall During Growth.

Month.	Tenterfield	Redbourneberry.	Armidale.	Baerami.*
	Points.	Points.	Points.	Points.
October .	312	...	227	...
November .	480	..	483	800
December ..	323	Nil.	264	50
January ...	673	649	294	[illegible]
February ..	349	139	131	100
March ...	312	218	199	100
April ...	42	29	42	...

* Approximate.

Results of Fertiliser Trial.

Fertiliser per acre	Redbourneberry		Tenterfield (J. and L. Chick).		Baerami.	
	bus.	lb.	bus.	lb.	bus.	lb.
*M13, 91 lb.	62	11	69	31		
*M11, 105 lb.	58	18	79	49		
*M8, 126 lb. .. .	68	33	92	41		
*M4, 98 lb.	67	14	86	0		
M4, 136 lb. ...	....		...		35	0
Blood and bone, 128 lb ...	58	0	.. .. ..			
Superphosphate, 70 lb. ...	53	32	65	44		
Superphosphate, 96 lb ..	....		..		39	0
Unmanured	62	11	66	50	35	0

*M 13 consists of 10 parts superphosphate and 3 parts sulphate of potash; M 11 consists of 1 part nitrate of soda and 2 parts superphosphate; M 8 consists of 4 parts sulphate of ammonia and 5 parts superphosphate; and M 4 consists of 2 parts sulphate of ammonia and 5 parts superphosphate.

Baerami.—Plots located on gently-sloping upland country; deep light red sandy loam of sedimentary nature. Previous crop wheat (unmanured) in 1923, which crop failed, partly from the pickling solution used for bunt prevention being too strong. Ploughed 8 to 12 inches deep in January, later harrowed twice. Wheat sown with spring-tine cultivator in July, and a spring-tine cultivation 4 inches deep in September. Seed sown 4th October in rows 3 feet 10 inches apart, three grains dropped every 3 feet. The field was harrowed on 7th and 14th October; on the latter occasion the plants were just above the surface. By the end of November three inter-row cultivations had been carried out. At this time portion of the crop was breaking into tassel. The abundant rains in November caused excessive growth and considerable suckering.

Central-western District (Dubbo Centre).

B. M. ARTHUR, H.D.A., Agricultural Instructor.

In conjunction with Mr. J. D. Berney, of "Kildara," Eurimbla, via Cumnock, a maize variety trial was conducted during the past summer season.

The soil was a deep chocolate loam of a limestone origin, undulating, sloping from north to south.

The previous crop was oats and wheat, 1923, which was fertilised with 60 lb. of superphosphate. The land was disc ploughed in July, 1924, 5 inches deep, harrowed in August, springtooth cultivated in September, mouldboard ploughed in October (necessitated by heavy rain) and harrowed.

The seed was sown partly on 11th October, and the balance on 17th October, using a combined 15-hoe wheat-drill, blocking up all but two drills, and sowing the rows 5 feet 10 inches apart. Seed was applied at 8 lb. per acre, and superphosphate was applied at the rate of 56 lb. per acre, applied through three hoes, one on each side of the seed row, as well as the ones in which the seed was sown.

Germination was good, but the crop had to be thinned out owing to uneven spacing. Two cultivations were given to the young growing crop, using the combined springtooth cultivator, damage to the crop being avoided by removing the tines nearest to the rows.

The Season.

The season was not all that could be desired. Heavy rains in November washed the soil to a certain extent, caked the surface, and created a boggy condition which prevented cultivation being carried out.

Consequently summer weed growth got away, and grew prolifically, and could not be controlled.

Subsequent rains received during February, March, and April were of a light nature, and not quite sufficient for a gross feeder such as maize; therefore the plants were not fully supplied with moisture requirements, and did not wholly fill the cobs.

Considering the disabilities, the yields, though not by any means large, were fairly satisfactory, especially as the distance between rows was nearly 6 feet, having been selected for convenience in cultivating on a farm mainly confined to wheat growing, and equipped with implements for that class of work. The results warrant a further trial of some of the varieties, namely, Kennedy, Iowa Silvermine, and King of the Earlies.

A small manurial trial was incorporated, and eight rows were sown without manure in the plot of Funk's Yellow Dent.

As superphosphate is generally followed by a vigorous response on this limestone country, it was not surprising to find an increase of 1 bushel 16 lb. due to the application of superphosphate.

The rainfall during fallow and growing periods was as follows:—

1924, July	299 points		1925, January	202 points	
August	135 „		February	157 „	
September	412 „		March	162 „	
October	129 „		April	13 „	
November	742 „				
December	159 „				

The crop was harvested at the latter end of April, and stored in bags until August to allow the moisture to dry out. A percentage of the bags of cobs were weighed, and then thrashed in order to find the shelling percentage, and finally the total weight of shelled grain was obtained.

The following are the results:—

Variety	Yield per acre.		Variety.	Yield per acre.	
	bus.	lb.		bus.	lb.
Kennedy	24	30	Bathurst Crossbred	19	36
Iowa Silvermine	22	11	Funk's YellowDent (manured) ...	18	35
King of the Earlies	21	38	Funk's (no manure)	17	19
Yanco Crossbred	21	12	Early Morn	9	54

Use of Spreaders with Bordeaux Mixture.

Among the vine experiments conducted by the Department during the last two seasons were some connected with the addition of spreaders to spray mixtures

Last season the Department conducted on Mr. C. C. Kennett's property at Glenfield two tests with spreaders as follows:—

1. The addition of casein at the rate of 1 oz. to 10 gallons of Bordeaux of 6-4-40 strength.
2. One pint of resin fish oil soap to 25 gallons of 6-4-40 Bordeaux.

It so happened that the weather conditions experienced during the season, particularly in the earlier part, were ideal for the conduct of such experiments, as downy mildew was very prevalent.

Mr. Kennett carried out the experiments for the Department, and reported very favourably at the end of the season in regard to the use of the resin fish oil soap spreader. From what I saw of the experiment this spreader certainly was a success at Glenfield, and the vines carried their foliage much better than those to which the ordinary spray had been applied.

The previous season Mr. H. G. White, Superintendent of Narara Viticultural Nursery, carried out similar experiments, and in his report last year he somewhat favoured the casein as a spreader when compared with the fish oil soap.

From the data to hand it appears that one is as good as the other, but that spreaders are certainly an advantage as against Bordeaux without them. The casein is certainly cheaper, being a little less than half the cost of the resin fish oil soap, and more easily procurable. However, resin fish oil soap is easily emulsified and is worthy of a trial by growers.—H. L. Manuel, Viticultural Expert.

Field Experiments with Maize.

GRAFTON EXPERIMENT FARM.

LATENESS OF CULTIVATION TRIALS, 1919-25, SUMMARISED.

G. NICHOLSON, H.D.A., Experimentalist.

THE general practice in coastal districts in the after-cultivation of maize is to clean out the middles with a single-horse cultivator shortly after the maize has been hilled. One of the critical stages in the growth of the maize plant, determining the difference between good and poor yields, is during the tasselling period. It is thought by some that by continuing cultivation up to tasselling time—by maintaining the mulch and holding weed growth in check—it is possible to conserve more moisture, which will ultimately result in increased yields. To compensate for the extra cultivations it would be necessary for the increase to be sufficiently large to cover all costs incurred and show a reasonable profit. It is to be expected that the most striking results will be obtained in seasons when the rainfall has been good during the early stages of growth but deficient during the tasselling period. It was to compare the two systems and obtain definite information as to which will result in the more profitable returns that the above series of trials were commenced at Grafton Experiment Farm in 1919. The experiment occupied a permanent site, on black alluvial soil, fairly typical of the alluvial soils of the Clarence, and was laid out as follows:—

Plot 1.—Given as many cultivations as necessary to tasselling.

Plot 2.—Given one cultivation only after hilling.

Plot 3.—Given as many cultivations as necessary to tasselling.

In each season the experiment was planted during November with the early-maturing variety Leaming. The rate of seeding was uniform throughout, namely, three grains every 32 inches sown in rows 4 feet apart, which is equivalent to 8 to 9 lb. of seed per acre. All cultivations previous to sowing were uniform, and such as to place the land in good order at planting time.

Notes on the Seasons.

1919-1920.—Experiment planted for the first time. Good rains fell during December and January, when the maize would be tasselling. Plots 1 and 3 received two additional cultivations, and these had the desired effect of preventing the soil from caking and checking weed growth. An increase of 5½ bushels was obtained by practising late cultivation.

1920-1921.—The plots were flooded during the winter of 1921, damaging much of the maize, and no results were obtained.

1921-1922.—Plots 1 and 3 received two additional cultivations. The soil was kept in better order and free from weeds. Nearly 7 inches of rain fell during December, followed by a hot dry January, when only 22 points

(three falls) were recorded. The value of additional cultivations during the dry January are clearly shown in the results, which disclose a satisfactory increase of 6½ bushels.

1922-1923.—The middles of all plots were cultivated on 15th January. Owing to the dry weather during the latter part of January, February, and March, and the condition of the soil, further cultivations were unnecessary. As the plots had received identical treatment to tasselling, a further cultivation was given to plots 1 and 3 on 19th February, which was some time after tasselling. It will be seen from the results that this latter cultivation had a detrimental effect on the yield.

1923-1924.—Plots 1 and 2 received one additional cultivation. Owing to almost continuous rain of a light nature, totalling 5½ inches, which fell during the latter part of January and early in February, the value of the latter cultivation was practically destroyed. Results show an increase of only 2½ bushels in favour of the additional cultivation.

1924-1925.—Owing partly to good seasonal conditions, the procedure for this season was varied. Yields from only two plots instead of three were obtained; the third plot was discarded owing to different treatment. It was not possible, owing to rain, to cultivate the middles until 12th January, by which time the maize had commenced to tassel. Plot 1 received two additional cultivations during January and February, and in comparison with Plot 2 presented a very clean appearance. Good, evenly distributed rains, totalling 15.7 inches, fell during January, February, and March, which favoured a heavy growth of weeds. The plot receiving the extra cultivations shows the satisfactory increase of 7½ bushels. This increase may be attributed to the sweetening effect on the soil and freedom from large weeds, due to cultivation.

RESULTS During Seasons 1919 to 1924.

Treatment.	1919-20.		1921-22.		1922-23.		1923-24.		1924-25.		Average.	
	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.
Cultivated to tasselling... ...	68	36	44	38	33	19	56	13	70	24	54	37
Cultivated once only after hilling	63	16	38	11	34	45	53	36	62	45	50	31

Year.	Increase (or decrease, in italics) due to treatment.		Value of increase or decrease.			Cost.		Net Profit or Loss.		
	bus.	lb.	£	s.	d.	s.	d.	£	s.	d.
1919-20	5	20	2	10	11	9	0	2	1	11
1921-22	6	27	1	12	5	9	0	1	3	5
1922-23	*1*	*26*	*0*	*8*	*1*	*4*	*6*	*0*	*12*	*7*
1923-24	2	33	0	7	9	4	6	0	3	3
1924-25	7	35	1	6	8	9	0	0	17	8
Average	4	7	1	1	11	7	2	0	14	9

The above figures were arrived at on the following basis:—Value of maize on the farm: 1920, 9s. 6d. per bushel; 1922, 5s.; 1923, 5s. 6d.; 1924, Viticul1925, 3s. 6d. Cultivations valued at 4s. 6d. per acre.

Conclusions.

The table of results shows that an average increase of 4 bushels 7 lb., valued at 14s. 9d., is obtained by adopting the practice of continuing cultivation up to tasselling. In only one year was the yield decreased, and that when the cultivation was not carried out until some time after tasselling. The increases, though not large, have been sufficient to cover all costs and show a profitable margin.

The advisability of continuing cultivation to tasselling will depend mainly on seasonal conditions, the growth of the crop, and the condition of the soil. No hard and fast rule can be laid down, but the best results are likely to be obtained on soils that have a tendency to cake badly, or in seasons when the early part of the growing season has been good, followed by dry weather at tasselling. On light soils well supplied with humus the soil will have a tendency to be self-mulching, and extra cultivation may not help to increase the yield to any appreciable extent. Under favourable conditions a variety may sucker freely and produce a profuse sufficient growth, completely shading the soil, thereby giving rise to such a condition that any extra cultivation would be unnecessary.

Return of Infectious Diseases Reported in August.

The following is the return of outbreaks of the more important infectious diseases reported during the month of August, 1925.

Anthrax	1
Pleuro-pneumonia contagiosa	6
Piroplasmosis (tick fever)..	Nil.
Swine Fever...	Nil.
Blackleg.	1

—Max Henry, Chief Veterinary Surgeon

The Extraction of Oil of Lemon.

Oil of lemon is a volatile oil contained in distinct cells in the exterior rind of the lemon, which may be separated by simple expression.

The rind is first grated from the fruit and then subjected to pressure in a bag of fine cloth. The oil thus obtained is allowed to stand till quite clear, and is then decanted and kept in stoppered bottles.

The oil may also be obtained from the grated pulp by distillation, but it is stated that the product obtained this way, though less liable to change when kept, has less of the peculiar flavour of the fruit, and for this reason expression is generally preferred.

A third method, used in Calabria and Sicily, is to put the grated rind into hot water and skim off the oil as it rises.

The finest oil is obtained by the use of an instrument made of tinne copper, bowl shaped, and armed with concentric rows of short spikes. Attached to the bottom of the bowl is a hollow handle closed at the bottom, which serves as a receiver for the oil as the fruit is rubbed by the workman over the sharp teeth.—A. A. Ramsay, Chemist.

The Queensland Producers' Association.

H. H. BENTLEY, A.F.I.A., F.A.I.S., Secretary, Council of Agriculture, Brisbane.*

(1.) ITS CONSTITUTION, OBJECTS, AND POWERS.

THE Queensland Producers' Association is an association open to all primary producers in Queensland, including share-farmers but excluding persons employed on wages or piece-work rates. The outline of the organisation was first made public by the then Premier on 21st February, 1922. The objective aimed at was the organisation of the whole of the farming interests into a composite body for the purpose of enabling them to speak with one voice, it being recognised that hitherto various farmers' associations had been in existence which, while of practical value to certain districts and certain industries, had not been able to speak for the industry as a whole. As an initial step the Government convened a conference of representatives of the dairying industry on 24th March, 1922, and at that conference a scheme was submitted in detail and adopted unanimously. As a result of this, an Act called "The Primary Producers' Organisation Act of 1922" was brought into being on 15th August, 1922, with the following title: "An Act to promote the Agricultural and Rural Industries by the Organisation of the Primary Producers of Queensland in a completely Unified National Organisation, and for other incidental purposes." The Act provides, among other things, for—

(*a*) The constitution of the Council of Agriculture, District Councils, and Local Producers' Associations, every primary producer being eligible for membership, which does not involve any entrance fee or annual subscription. The functions and objects of the Council shall be to co-operate with the Department of Agriculture, District Councils, Local Associations, and other bodies and persons.

(*b*) The constitution of not less than fifteen districts, each having a District Council.

(*c*) The formation of Local Producers' Associations.

(*d*) The creation of Advisory Boards to advise the Council of Agriculture in respect to the general business of the Council, &c.

(*e*) The establishment of a fund which shall be charged with the payment of all expenses incurred by the Council of Agriculture.

(*f*) Power by the Council of Agriculture to make general levies and special levies.

(*g*) A subsidy by the Government of not less than £ for £ for the first five years in which the Act is in force.

(*h*) Necessary power to appoint a director and the necessary staff.

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* Paper read at third annual State Conference of Agricultural Bureau, held at Hawkesbury Agricultural College, July, 1925.

(2.) HOW IT FUNCTIONS.

There are approximately 30,000 farmers in Queensland of whom 24,014 were members of the Queensland Producers' Association on 1st July last.

Local Producers' Associations.

Every primary producer in Queensland is entitled to join a Local Producers' Association. To establish an association it is necessary that fifteen primary producers should make similar application, and on receipt of advice that this action has been taken, the branch is registered at head office and stationery and a stamp allowance forwarded for the use of the branch. There is no limit to the number of the Local Producers' Associations that may be constituted. Recognising the difficulties primary producers experience in attending meetings, it is felt that it would be better to have a large number of branches scattered all over the districts with a membership of fifteen and upwards, rather than a limited number of branches with a large membership. These Local Producers' Associations meet as a rule once a month. A copy of their minutes is sent to head office and another copy is sent to the secretary of their District Council. Local Producers' Association secretaries are paid 10s. per meeting honorarium, and an allowance of 2s. 6d. for lighting and cleaning is also made per meeting. The Department of Education permits the use of school rooms for the holding of meetings free of cost, and only imposes the obligation of leaving them in as cleanly a state as they are found.

At 1st July there were 775 Local Producers' Associations operating. The Local Producers' Associations are, in effect, progress associations as well as local producers' associations, and they exercise the right to deal with all matters affecting their particular locality so long as they do not affect any other contiguous Local Producers' Association. In the event of such occurring the business must be passed on and handled by the District Council. Provision is made for honorary or associate membership to enable school teachers and others to become members.

District Councils.

There are at present nineteen district councils in existence. The creation of a district is carried out by gazetting the boundaries included in the area, which generally follow the boundaries of the clerk of petty sessions districts, embracing several such clerk of petty sessions districts in each Queensland Producers' Association district. Every primary producer is eligible for election to the District Council in the district in which he lives. The Council is elected by the postal ballot of the producers. Each District Council takes action on all matters that are of an inter-Local Producers' Association interest, or of interest only to that particular district. Where the subject is one which affects two or more districts the business must be forwarded to the Council of Agriculture for determination. At the first meeting of an elected District Council one member is chosen as the representative for that district on the Council of Agriculture. The secretary is paid an honorarium varying from £5 to £25 per month, in accordance with

the amount of work he has to do, both secretarial and organising. An advance of £5 is made for incidental expenses such as postage, hire of hall, telegrams, &c., for the use of the District Council Secretary. Expenses are allowed of £1 1s. per day for each sitting or travelling day of District Councillors, from the time they leave their homes to the time they return, together with first-class rail fares, or 9d. per mile where they use their own motor cars. In some cases an extra allowance of 10s. per night is made, but only on occasions where it would be unfair to ask the particular District Councillor to travel to his home during the night. The District Councils were meeting monthly, but are now meeting bi-monthly. The District Councils forward their minutes to head office, from which are taken all resolutions requesting action by the Council of Agriculture.

Council of Agriculture.

The Council of Agriculture, as already stated, consists of twenty-five members, nineteen of whom represent the nineteen District Councils just described. The other six are Government nominees, and with the exception of the President, who is the Minister for Agriculture, are all experts in their respective spheres. At the present time we have on the Council the ex-Director of Dairying (who is now Under Secretary to the Department of Agriculture), the Director of Agriculture, the Director of Sugar Experiment Stations, the Commissioner of the State Trade Department, and the Commissioner for Railways. It will be easily seen what an advantage it is to be linked up with such Government officials.

The Council formerly met monthly, but now meets bi-monthly. Its business is the final consideration of all matters which have come through from the Local Producers' Associations, District Councils, and Standing Committees. In order to crystallise business coming up from the country, it is essential that standing committees should be appointed to deal with these matters, and with the object of giving the requests of each section of industry effective consideration the following committees composed of members of the Council of Agriculture, are in existence, viz., administrative, sugar, dairy, general agriculture, fruit; a Cotton Advisory Board is also in being.

These committees meet bi-monthly. The results of their deliberations are submitted to the Council in the form of resolutions.

I think it can be safely said that this method of administering the affairs of the Queensland Producers' Association is one which eliminates every request that will not stand a thorough investigation, besides which it reduces the volume of correspondence which under any other circumstances it would be impossible to handle. This method also gives local autonomy to each section of the industry, without giving them the scope to take action which might be adverse to another section of industry elsewhere. Experience has proved the wisdom of this course, as on more than one occasion a line of policy favourable to one section of agricultural industry if carried out would have been inimical to another section. The bringing together of

farmers in the different sections of industry has undoubtedly educated them as to the other's disabilities, and has promoted a spirit of tolerance for the other man and a spirit of co-operative effort for all producers. It will doubtless interest you to know that our inward and outward correspondence at head office only totals somewhere round about 80,000 documents per annum.

Members of the Council of Agriculture are paid the following fees:—£2 2s. per sitting day, £1 11s. 6d. per travelling day, with first-class rail fares.

District Organisers.

At the inception of the movement field representatives or district organisers were appointed for each of the nineteen districts, the duties being to make a personal canvass of the producers, explaining the objects of the organisation, enrolling them as members, and establishing the Local Producers' Association. As time went on it was felt that the necessity for these men did not exist to such an extent, and as circumstances permitted the number was consistently reduced until now we have only one man in the field; but on the other hand the District Council Secretaries, as already mentioned, do some organising, each in his own district.

Finance.

For the first year as the scheme was quite an innovation and no levies were in operation, the Government very generously provided £25,000 for the expenses of the Queensland Producers' Association. In the second year of its existence, owing to a very severe drought that had prevailed for the first and second years, the Government again came to the assistance of the organisation and provided a sum of £35,000.

Commencing with 1st July, 1924, a general levy was brought into operation. Serious consideration was given to the question of the basis of levy and the method of collection, including per capita, per industry, and definite rates for definite produce. Finally an *ad valorem* basis was adopted, providing that the producer should pay the equivalent of 1d. in every £2 on the amount payable to him for produce sold on his behalf. The method of collecting is unique, inexpensive, and entails very little work on anybody's part. Everyone concerned in the collection receives some remuneration for the effort involved. Realising the uneconomic method of insisting that everyone selling or buying from a producer should render a monthly statement representing the amount of the levy deducted, a system of levy stamps was introduced. Briefly, this is how the scheme operates—Stamps of a special design were printed by the Government Printer in denominations from £1 to £20. Supplies of these stamps were forwarded to each clerk of petty sessions in the districts in which we operate, for sale to those requiring them. The clerk of petty sessions gets a commission of 2½ per cent. on sales, and the buyers receive a discount of 1¼ per cent. on purchases. It is incumbent on everyone selling on behalf of or buying from a farmer his primary produce to attach to the credit note or invoice, as the case may be, levy stamps to the value of the levy deducted. This assures the producer

that the levy which has been deducted from his proceeds is not being retained by the man who deducted same, because he in turn has to buy the stamps which appear on that particular debit note.

With regard to butter, cheese, milk, and sugar factories, and also to all pool boards, exemption from the necessity of affixing stamps to each individual supplier's account is granted conditionally on these corporations rendering a monthly statement of the total purchases, and on that statement must appear levy stamps to the value of the levy deducted. Those who have most work in connection with the levy stamps are produce and fruit merchants, and for their trouble they get 1¼ per cent. discount when buying the stamps.

The levy was estimated to yield £20,000, and actually yielded £20,800 for the year just ended. This represents a cost to each producer of 13s. 11d. for the year.

It is pleasing to be able to say that no serious objection has been raised to this method of collection, largely because it has given to everyone affected some remuneration for his trouble. The system so obviates detailed work that even allowing for the small amount of clerical work involved in head office, after giving 3¾ per cent. away, the total expenditure incurred in collecting the levy did not reach 5 per cent. Additionally, the Government will subsidise this year's operations by the amount of the levy collected last year.

The Act empowers the Council of Agriculture to make a general levy without any reference to the producers, but all special levies are subject to a ballot on the written request of 100 or more producers, and require a bare majority to carry them. To date the council has not made any special levies, but district councils have done so. These levies have been for the purpose of paying individuals appointed to watch farmers' interests in certain directions, and also for assistance in subscribing to a fund for a special entomologist in the particular district concerned.

The Act provides that every producer is entitled to a detailed statement of our accounts, which has the effect of assuring producers that their money is being spent with discretion, and for those who are interested enough to do so, copies of our accounts are available on receipt of a written request.

Area over which the Queensland Producers' Association Operates.

Reference has already been made to the fact that district councils comprise one or more petty sessions districts. In might be assumed, if not otherwise pointed out, that the Queensland Producers' Association operates over the whole of Queensland. This is not so, however. The area over which the Queensland Producers' Association at present operates is the area which is most densely populated, and which contains practically all the primary producers other than graziers. It is open to the Queensland Producers' Association to take in further areas, or to eliminate some of the area at present taken in, as it desires.

"Queensland Producer" Newspaper.

Among its activities, the Council has established a weekly newspaper called the *Queensland Producer.* It was early recognised that, in order to keep members fully posted regarding the doings of their association, some form of weekly production was essential. At first it was thought to effect this by means of leaflets or bulletins, which would have cost a very large sum of money. On further consideration, it was decided to establish this newspaper, which has now been in existence for two and a half years. Up till 1st July it was forwarded to members for a subscription of 2s. 6d. per annum, and was subsidised by the Queensland Producers' Association at the rate of 2s. 6d. per member per annum. For this year the price has been raised to 5s. per annum, but the cost is now being taken out of the levies. The paper is sent to every member of the association. Its mission, in addition to educating agriculturists on the latest commercial and economic phases regarding agriculture, is to publish the reports of meetings of all local producers' associations, district councils, and the Council of Agriculture, thereby enabling each producer to follow the thoughts and activities of all the branches of the association. It is also very useful in putting questions to the producers of general interest instead of sending circular letters, thereby saving a considerable amount of correspondence.

(3.) ITS ASSOCIATION WITH OTHER ACTS.

The Co-operative Associations Act provides for the formation, registration, and management of Primary Producers' Co-operative Associations, and for other purposes incidental thereto. The Council was responsible for having this Act placed on the statute book.

The Agricultural Bank Act makes provision for advances to co-operative companies and associations, and to farmers and others.

The Fruit Marketing Organisation Act of 1923 is the Act under which the Committee of Direction derives its status. So far as the Council of Agriculture is concerned, section 9 gives the right to nominate one member on the Committee of Direction, and section 12 provides that where any dispute exists between a local association and a sectional group committee or the Committee of Direction, or between a sectional group committee and the Committee of Direction, the dispute shall be referred to the Council of Agriculture, which shall decide the matter, and whose decision shall be final.

The Primary Products Pools Act of 1922-23 provides for the constitution of boards representing growers of specified commodities, and to confer powers on boards so constituted with respect to the marketing of the commodity for which it has been constituted. The Act is commonly known as "the Pools Act." It gives power to the primary producer to market his produce by what is commonly called compulsory co-operation. The Government may, on request by the Council of Agriculture, or by petition signed by a representative number of growers of any commodity or by an organisation representing the growers of a commodity, proclaim its intention to create a pool. If within thirty days after such notice is published, fifty or

more growers of the commodity concerned object and petition the Minister to that effect, a poll must be taken, on which all the growers of that particular commodity have a vote. If less than 75 per cent. of those voting vote in favour, then no pool is constituted.

Assurances have recently been published of the Government's intention to reduce the necessary affirmative vote to 66 per cent. In the event of an affirmative vote, the particular commodity becomes subject to the absolute control of the Pool Board. This does not necessarily mean that every producer will be paid the same price for his produce. As a matter of fact, he is paid in accordance with the quality of his produce, as it is the universal practice to establish various grades. The term of the pool's existence is declared in the *Gazette* notice. A board is then constituted to manage the pool by a vote of the producers. The Council of Agriculture has the right to appoint a person to represent it on every pool board, and also to appoint the chairman. In the latter connection the practice is to consult the board as to its choice, and recommend its nominee for appointment as chairman, though should occasion arise when the Council has good reason to appoint someone else it will doubtless exercise its right.

The Stallions Registration Act of 1923 has for its object the improvement in the breeding of horses. The Act is in force in such districts as the Governor-in-Council, on the recommendation of the Council of Agriculture, may from time to time declare. The Council of Agriculture also has the right to approve or disapprove of the various nominees for these boards.

(4.) SOME OF THE ACHIEVEMENTS TO DATE.

It would be impossible in a limited space to detail the various achievements since inception. I therefore confine myself to the mention of a few of the major activities:—The association has been responsible for the initiation of the movement which resulted in the passing of the Federal Control Export Act relating to dairying products; imposition of anti-dumping duty or South African maize; prevention of reduction of duty on bananas; valuable assistance rendered to the sugar industry in advocating retention of embargo and Federal control as it now exists. The association and council have been responsible for the establishment of the following pools:—Atherton Tableland maize pool, which has now three large maize silos, involving an expenditure of £70,000; Atherton Tableland pig pool, which has been of tremendous pecuniary benefit to the pig producer; Committee of Direction of fruit marketing; Queensland Egg Board; peanut pool; Queensland butter pool; cheese pool; arrowroot pool; and canary seed pool.

The general effect of all these pools has been the stabilising of the market, resulting in better prices to the producer without penalising the consumer, due to the ability of these boards to feed the market according to its requirements.

The Co-operative Associations Act, which in effect is not unlike the Co-operation, Community Settlement, and Credit Act in New South Wales, has been placed on the statute book. Already the registrations under this Act total seventy-two.

Rural credit, fodder conservation, farm cost data, cotton and general farming boards *re* wages claim, agricultural machinery inquiry, reduction in price of fertilisers, reduction in freights on starving stock, amendments in several Acts concerning primary producers, are all achievements of the association.

Local producers' associations and district councils have initiated and have been responsible for many improvements in the way of better roads, greater postal, telegraphic, and telephone facilities, establishment of additional schools, better facilities in connection with railage of produce, storage of same at railway stations, such as additional grain sheds, also weighbridges, &c.

Among proposals now under consideration are a grain and fodder board for the State, and water supply for settlers.

(5.) TREND OF DEVELOPMENT.

At the inception of the Queensland Producers' Association, it was recognised that there was an urgent necessity for organising the farmers into one composite whole, but that sectional representation should be also provided. The composite nature was accomplished through the Local Producers' Associations, District Councils, and the Council of Agriculture, and sectional interests were afforded representation in the various standing committees. The Council is now of opinion that it is desirable to make the representation more sectional than composite, and to that end it has resolved on a scheme of re-organisation which will make members of marketing bodies, such as members of the various pools, eligible to sit as members of the Council of Agriculture, together with a reduction in the number of district councils, whose representatives will also be included in the personnel of the Council of Agriculture. This re-organisation movement, it is hoped, will be brought into effect on 1st January next.

The trend of world affairs to-day appears to be such that the time for individual action has nearly disappeared, and its place must be taken by co-operative action. In fact, so acute are conditions becoming that it would seem essential that the Government of every country must of necessity come to the assistance of its people where possible, to enable them to compete with the people of other countries of the world. In this connection the Government can do a great deal more than many people suppose, and it ought to do a great deal less than many people expect. For instance, the Government, as representing the people, should do all it can on behalf of better farm practice, better farm business, and better farm life. The Government may investigate and interpret facts and principles underlying the development of agriculture and country life, advise individuals and groups how best to take advantage of these facts and principles, and demonstrate the best methods of accommodating them to the actual needs and conditions. On the other hand, the Government should not participate in the farmers' business nor directly interfere with their community life; should not try to run a man's farm for him, nor to manage the farmer's business transactions. The rural problem is so large that the Government's

efforts must be supplemented by voluntary aid and financial support, and it should encourage the development of self-help. To quote the words of President Coolidge in an address to Congress recently:—

> "No complicated scheme of relief, no plan for Government fixing of prices, no resort to the Public Treasury will be of any permanent value in establishing agriculture. Simple and direct methods put into operation by the farmer himself are the only real sources for restoration of an adverse agricultural position. His customer with whom he exchanges products of the farm for those of industry is organised; labour is organised; business is organised; and there is no way for agriculture to meet this unless it, too, is organised. Systems of co-operative marketing created by the farmers themselves, supervised by competent management, without doubt would be of assistance, but they cannot wholly solve the problem. Our agricultural schools ought to have thorough courses in the theory of organisation and co-operative marketing."

Anticipating that requests will be made by the New South Wales farmers for pools, and bearing in mind the experience gained in the last two years in Queensland in this connection, I would take the liberty of pointing out that a misconception of the pooling principle may be established if great care is not exercised in the business conduct of pools. The real motive for forming pools is to give a better return to the farmer without penalising the consumer. This can only be done by efficient management, which will feed the market in keeping with its requirements, and will avoid the possibility of consumers looking upon pools as nothing more or less than maximum price-fixing methods—a system that the public would not tolerate for any length of time. To my mind, the Pools Act is only a means to an end. It is an opportunity for the farmers who hitherto have marketed as individuals to learn the value of co-operative marketing, and to ultimately take advantage of the Co-operative Associations Act, and thereby market all their products under that Act.

IMPORTANCE OF WHEAT SELECTION.

EVERY observant wheat-grower can do much towards increasing his wealth, and that of the Commonwealth, by selecting from his crops the best plants, and growing the grain from these in separate plots. Within recent years, judging by correspondence, the interest taken in this work by wheat-growers of every State, has increased several hundred per cent. . . . . . .

Most farmers sow graded seed, which is really the first step in "selection," since, by the results of numerous experiments it has been determined that the best developed seed gives returns higher than ungraded seed, other things being similar; but the advanced farmer is not satisfied with this, since it does not create a strain of the variety most suitable for his conditions. An advantage a grower who practices selection gains is that he need never change his seed. It is the farmer who does not select who finds it an advantage to have a change of seed.—HUGH PYE, Cerealist to the Victorian Department of Agriculture.

Crop Investigations on the Experiment Farms.

R. G. DOWNING, B.Sc. (Agr.), Senior Experimentalist.

A VERY important branch of the work which is being carried out on the various departmental experiment farms is that dealing with crop experiments. Upon the results of this work are based many of the recommendations made to farmers. Particular accuracy is therefore necessary in recording the yields from the various crops and from the different methods of soil and crop treatment, while such tests must be carried on for a sufficient number of seasons to enable definite conclusions to be drawn. From time to time, as results become available, reports are published in these pages, but while this procedure brings before readers of the *Gazette* important information as it is obtained, it scarcely conveys an adequate idea of the scope of the investigations which are being conducted. For this reason, and because it is some years since a comprehensive statement has been made regarding this phase of the Department's activities, the following account of the present position has been prepared. It is not proposed to go into details of the various trials nor of the experimental methods adopted to ensure uniform conditions in the tests, but merely to indicate the general lines on which the work is being carried out.

Systematically planned and conducted field trials are in progress at Hawkesbury Agricultural College and Wagga, Cowra, Bathurst, Trangie, Condobolin, Nyngan, Yanco, Coonamble, Glen Innes, Wollongbar and Grafton Experiment Farms, while similar work is projected for Temora Experiment Farm next year. It will be seen that the above farms are representative of a considerable area of the State, while on account of the diversity of soil and climate embraced the crops grown and methods of farming practised vary considerably from farm to farm. The experiment work being carried on may be classified as follows:—

(1) Variety trials.
(2) Rotation and cultivation experiments.
(3) Fodder trials.
(4) Fertiliser tests.
(5) Miscellaneous experiments.

Variety Trials.

This section of the work is mostly confined to farms at which growing of winter cereals forms the principal part of the cropping programme. Without going into details of the technique employed, it may be stated that the practice is to test in these trials new crossbreds, introduced varieties and improved strains, as obtained from the plant Breeder or from

other sources, comparing them with standard varieties under conditions as uniformly accurate as possible. The tests are carried out in triplicate, plots being $\frac{1}{30}$ acre in area. This method has displaced the former system of plots of $\frac{1}{10}$ acre with a check variety every third plot. If a variety which has had sufficient trial under these conditions shows promise, it is then tested over a wide range of conditions on the farmers' experiment plots, under the supervision of the local agricultural instructors. From time to time old varieties are outyielded by improved sorts, while various defects become apparent in new varieties as they are subjected to the test of differing seasonal conditions. By this means the Department is accumulating valuable data, and is able to make very useful recommendations regarding the most suitable sorts for the different districts.

These tests are carried out under farmers' conditions—that is to say, the crop from planting to harvesting is treated exactly as a paddock crop, the latter operation being carried out by the method prevalent in the district. The importance of this is obvious when it is pointed out that if a wheat variety trial, for example, were cut and threshed in a district where harvesting was carried out with harvesters and headers, certain defects, such as shelling, lodging, and tendency to weather badly, might not become apparent until the variety had passed into fairly general cultivation. Results are summarised at intervals of three years, and the yields over this period compared with those of standard varieties give a fairly reliable indication of the value of the different sorts. Tests of winter cereals are divided into two sections—early planting and the late planting—while in certain districts separate plantings are also made for hay and grain. The time of planting and purpose for which a variety is to be tried are recommended by the Plant Breeder, who has had the variety under trial in small plots for a considerable time.

Rotation and Cultivation Experiments.

Better seed, more suitable varieties, the use of superphosphate, and improved methods of soil management have all contributed to the advancement of agriculture in New South Wales during the past twenty years. While considerable progress along all these lines is still possible, it is generally recognised that the main avenue of progress for the future will be in the direction of more systematic methods of crop rotation and of cultivation. Hence it is that considerable attention is being devoted by the Department to investigations bearing on these phases of agricultural practice. The means by which it is hoped to obtain data along these lines are: (*a*) Trials of new crops which, if successful, may be incorporated in systematic rotations with the main crop of the district, (*b*) rotation experiments, and (*c*) cultural experiments.

Trials of New Crops.—As regards (*a*), such introductions as Sudan grass, cowpeas, velvet beans, soy beans, and Bokhara clover have in certain localities given very good results, and in consequence are being successfully included in the cropping systems of these districts.

Crop Rotation.—The importance of crop rotation as a means of maintaining and even improving soil fertility has long been recognised. With the spread during recent years of various fungous diseases, particularly in the wheat belt, has come a fuller realisation of the absolute necessity of crop rotation as a factor in disease control. In the past the efforts of the Department in the wheat belt have been mainly directed towards impressing upon farmers the necessity of fallowing. Now that the practice of fallowing has become fairly general, more attention is being given to the question of crop rotation, and experiments in this connection are in progress at all the above farms.

As regards crops for these trials, in some districts considerable choice is possible on account of climatic conditions and the fact that summer crops may be profitably cultivated. Other points, such as the use to which a crop may be put and ease of handling on a large area, must be considered when choosing a crop for a rotation, apart from the effect of such a crop upon following crops. The plots for these trials are arranged in sets corresponding to the number of crops in each rotation. By this means each of the crops is sown each year. The following example will illustrate what is meant:—

	1921.	1922	1923.	1924.
Plot 1 .	Maize.	White Tartarian Oats.	Algerian Oats.	Soy Beans.
Plot 2 .	White Tartarian Oats.	Algerian Oats.	Soy Beans.	Maize.
Plot 3 ..	Algerian Oats.	Soy Beans.	Maize.	White Tartarian Oats
Plot 4 ..	Soy Beans.	Maize.	White Tartarian Oats.	Algerian Oats.

In all these tests the plots are from ¼ acre to 1 acre in area, in order to allow of accurate calculation of costs of production and to enable the exact computation of the carrying capacity of the fodder crops tested. Stock are used to the fullest possible extent in cleaning up fallows, profitably disposing of crop residues, etc., and for this purpose, as well as for feeding off, special temporary fencing is provided to separate the various plots.

In addition to the actual yields obtained in these experiments, much useful data is being accumulated regarding the general management involved in handling the various crops, when grown in succession to one another.

The co-operation of the scientific branches is also obtained from time to time regarding such questions as the effects upon soil fertility and disease control of the various crops in relation to one another.

Cultural Experiments.—Looking back over the records of this branch of agricultural experiment work as carried on during the past twenty-five years, one is struck by the gradual change in the attitude of experimenters generally towards the soil In the early days the soil was regarded as a more or less constant factor, and tests were mainly devised to test such points as deep *versus* shallow ploughing, mouldboard *versus* disc ploughing, harrowing *versus* no harrowing, and so on. It was expected the results of such trials would be capable of fairly general application, and considerable experience,

mainly of a negative character, was accumulated from this type of experiment. As knowledge of the various soil types increased, it was realised that different soils required widely different treatments, and that no hard and fast rules could be laid down regarding the operations to be carried out during the important time of preparation for seeding. As regards fallowing, for example, in the wheat areas the objective is a weed-free, well-mulched seed-bed, while the soil should be sufficiently consolidated to hold a plentiful supply of moisture within easy reach of the young seedlings. The method of arriving at this desirable condition necessarily varies with different types of soil. Seasonal conditions from year to year also largely determine the time and nature of the cultural operations with a corresponding choice in the type of implement used The fact that cultural problems are so local in character renders difficult the planning of experiments designed to apply over a wide area. Considerable latitude must be allowed to officers conducting such experiments regarding when and how they carry out the various operations. Results aimed at are of a general nature capable of as wide an application as possible—in other words, principles are investigated rather than details.

An experiment which is being conducted at Wagga Farm will serve to illustrate the plan on which such tests are carried out. The object of the experiment is to obtain data regarding methods of fallowing in the Wagga district, and the systems being compared are:

(1) Ploughed July; cultivated when necessary (*i.e.*, to restore the mulch or keep down weed growth) until planting.

(2) Ploughed July; weed growth kept down by sheep; mulched in February, and afterwards as necessary.

(3) Ploughed July; then as for plot 2, except that one cultivation is given in the spring.

(4) Ploughed as soon as possible (*ie.*, after rain) in the New Year; mulched when necessary and worked down to suitable seed-bed.

(5) Cultivated as soon as possible after harvest; ploughed July, and when necessary until planting.

(6) Ploughed February of year prior to planting; cultivated not more than three times during the fallow.

The plots in this experiment are ½ acre in area and the test is conducted under the rotation wheat and bare fallow. This means that two sets of plots are necessary, one set being fallowed and the other cropped each year. The fullest possible use is made of sheep in keeping the fallows clean.

The plots are ploughed uniformly with the type of plough considered at the time most suitable, while the choice of implements to perform the requisite cultivations during fallowing is left to the discretion of the officer actually conducting the trial. Much useful information of a general nature is being obtained from these trials regarding the practical application of the principles of fallowing under the different systems being tested. Accurate meteorological records are kept at the various farms, which records may be studied from time to time in conjunction with the results from the

trials. Where it is considered advisable, moisture and humus determinations may also be made with a view to understanding more completely the effects upon these soil components of the different methods of fallowing.

Experiments comparing the effects of variously timed cultural operations, such as early *versus* late ploughing in preparation for maize, as well as tests of various modifications in the standard systems of cultivation in different districts, are also being carried out. Results from several of these are very striking, and their effect will be to bring about many important changes in the cultivation of various crops.

Fodder Trials.

The important part played by stock in almost all farming systems naturally means that considerable attention has been given by the Department to investigations regarding the question of providing suitable feed for farm animals in time of drought and during annual periods of scarcity. The increasing extent to which farmers are profitably combining wheat-growing and lamb-raising has also resulted in greater specialisation as regards feed for lambing ewes. Much valuable work has been done along these lines, the effects of which are very apparent in certain districts. Whether winter or summer fodders are tested depends upon the climatic conditions of the different localities. In many districts, for example, a period of comparative scarcity usually occurs in the late winter and early spring, while in others the pastures should be supplemented during the whole of winter. In other districts of sparse summer rainfall, by the cultivation of such introduced crops as Sudan grass, a supply of succulent feed is possible, while the ordinary pastures are harsh and dry.

These tests are conducted on plots from ½ acre to 1 acre in area, each crop being fenced as it arrives at the correct stage for feeding off, and stock turned on. By this method the actual carrying capacity of the fodder is ascertained, while the crop is given a chance to recover and may be thus fed off several times. Apart from the actual carrying capacity of the various fodders, other plants must be considered in assessing the value of a crop for the purpose. In a flush season, for instance, it may be more economical to run stock on natural pastures and convert the fodder crop to other uses, such as silage, hay or even grain. This consideration must guide one in deciding upon the crop or crops to be planted, and for this reason such crops as rape and turnips have been dropped in most of the mixed farming areas where oats, barley, wheat, and rye may be grown. It has been definitely established that for winter fodder the cereals give the best results. Tests are now confined therefore to varieties of these, which are in most districts grown in combination with a winter legume such as field peas or vetches. Palatability, disease resistance, and time of maturity are also considered in relation to the points mentioned above.

Speaking generally, from results obtained to date, in planting any large area for winter fodder, it is advisable to sow several cereals or varieties of the same cereal in order that a succession of fodders is obtained rather than that a considerable area should be ready to feed off all at once.

Owing to the fact that on most of the experiment farms pure seed of maize and sorghum is raised, with a consequent necessity for sowing at most only two varieties of these crops, it is not possible to carry out comprehensive summer fodder tests. Newly-introduced varieties of sorghum and similar crops are tested from time to time, and if found promising are tried on the farmers' experiment plots against standard varieties.

Much useful work is being conducted on the coastal farms with various summer legumes. Varieties and improved strains of cowpeas, velvet beans, and a number of recently-introduced legumes are being tested in this way. The promising results obtained from these crops are very satisfactory when considered in conjunction with the facts (i) that the pastures on the Upper North Coast are mostly lacking in legumes, and (ii) that for the maximum returns to be obtained from a dairy herd this deficiency has (particularly at certain periods) to be made up by the feeding of costly concentrates. It is hoped that in the near future the cultivation of such crops as velvet beans will have a pronounced effect in increasing the stability of the dairying industry in this district.

Fodder conservation is another aspect of the question which is receiving attention. Trials are being conducted with various crops and mixtures of crops for ensilage in the various types of silos found best suited to the different districts.

Fertiliser Tests.

This phase of the work comprises tests of the standard fertilisers in various proportions on the main crops of the various districts, top-dressing experiments with those fertilisers on lucerne and pastures, and tests of such substances as lime, gypsum and sulphur, which, besides being of some possible fertiliser value, may have an ameliorating effect upon untractable soils.

As regards fertiliser experiments with wheat, results to date show that, except at altitudes of 2,500 feet and over, the application of superphosphate alone is the most profitable method of applying fertiliser, while in some districts, such as the north-west, no advantage is gained by using superphosphate. Fertiliser tests with this crop have therefore for some years been confined to comparisons of different quantities per acre of superphosphate, of various low grade phosphatic fertilisers, and of high-grade superphosphate. As the result of these tests and those carried out on farmers' experiment plots, the Department is in a position to make fairly definite recommendations for the various districts and their soil types throughout the wheat belt.

Maize fertiliser experiments are still being conducted, while similar tests with minor crops are also progressing, reports of these being published as results become definite.

Top-dressing of lucerne with superphosphate has given very profitable returns at most of our farms, and in some districts the practice is now almost universal. Top-dressing of pastures has been attended with such

striking returns that the experiments are now being extended to all of the experiment farms, and the Agrostologist is arranging for as many farmers' plots as possible.

Liming experiments were conducted at most of the experiment farms some years ago with negative results, and tests on farmers' experiment plots gave similar results. In spite of these results, the soils have been shown by chemical analysis to be distinctly acid as judged by standards applied to soils from other countries.

With the object of co-relating the results of chemical analysis with actual field results, an experiment has been carried on at Glen Innes Farm for several years, in which the lime requirement of a soil has been determined by the chemist and the necessary lime added. The limed plot is then examined annually to ascertain whether the lime-requirement figure varies. Limed and unlimed plots, on which oats are grown with and without superphosphate, provide data as to the effect of the treatment upon the crop. The experiment has not yet proceeded long enough to enable any conclusion being drawn.

Sulphur experiments have not so far proved that this substance may profitably be used as a fertiliser, nor has any effect upon soil texture been noticed.

Gypsum has given such promising results on the Murrumbidgee Irrigation Area that experiments have just been initiated at several other farms with a view to testing its value on the stiff soils of these districts.

These fertiliser tests are carried out in triplicate on plots $\frac{1}{30}$ acre in area, the general scheme on which the trials are conducted being similar to that for the variety trials.

Miscellaneous Experiments.

Under this heading may be grouped such work as fungicide experiments, seed stimulation tests, electro culture experiments, and trials similar in one respect, viz., that they involve principles which are fairly general in their application. In other words, the results of such tests when obtained may modify some phases of agricultural practice over a fairly wide area. The details of such trials naturally vary somewhat according to circumstances, but the general scheme followed is on the same lines as for the tests outlined under the other headings.

In addition to the investigations already indicated, important crop breeding and selection work is being conducted at most of the farms, while considerable attention is being paid to pasture improvement. There two sections are under the control of the Plant Breeders and the Agrostologist, respectively, and their officers, who visit the farms at regular intervals, instruct the experimentalists regarding the course of the work. The results from such tests very often form the basis for larger field trials, and in that way the various sections are often concerned in the progress of joint investigations. For example, paspalum renovation experiments which are being conducted at Wollongbar Farm involve the cultivation of several

crops with a view to providing cattle with fodder and replenishing the humus content of the soil. Similarly from time to time several branches of the Department may co-operate in such work as stock-feeding tests, which involve various specialised lines of knowledge. For this purpose a committee is constituted, and representatives from the different branches concerned plan and then supervise the work.

A committee, known as the Research Council, and consisting of the Under-Secretary (chairman), Principal of Hawkesbury Agricultural College, Biologist and Director of Botanical Gardens, Chief Inspector of Agriculture, Chemist, Chief Veterinary Surgeon, and Senior Experimentalist, exercises a general supervision over the investigational work of the Department. When it is considered that a test has been carried on for a sufficient length of time to enable definite conclusions to be drawn, the results are summarised, submitted to the Research Council, and, subject to its approval, published. Recommendations are made to this body regarding the finalising of the various investigations and the commencing of new work, while in cases such as mentioned above, where the co-operation of several branches is desirable, the necessary sub-committee is nominated by the council. This system of sub-committees has now been in operation for some years, and has worked very smoothly. Apart from the advantage to an investigation of such joint supervision, the arrangement has been very helpful in bringing officers in closer contact, thus overcoming to some extent the disadvantages arising from the present scattered nature of the Department.

The Value of Crushed Maize Cobs as Fodder.

Corn and cob meal, made by putting the whole maize ear through a crusher, is a feed largely used in America, and many farmers in New South Wales have also adopted its use in recent years. The fibre supplied by the cob or core adds to the bulk of the feed. Ruminants require a certain amount of bulk in their feed, and horses, although single-stomached, do not do well on concentrated feed alone. The addition of the ground cob to the maize, especially where bulk feed, like chaff or roughage, is not fed in sufficient quantity, has the desirable effect of lightening the concentrated feed, preventing it from forming into a solid mass in the stomach, and enabling the digestive juices to pour through it more readily. Pigs require a large amount of their feed in concentrated form, only having a comparatively small stomach, and it would naturally be thought that the addition of the comparatively large amount of fibre contained in the core or cob of maize would be detrimental. But actual experience does not greatly support this, especially if the corn and cob meal is boiled before being fed to pigs. This boiling probably renders a large proportion of the fibre more digestible. Farmers are successfully feeding the meal to pigs in this form.

The main point in considering the installation of a corn and cob grinder is the relative cost of preparing the feed. Farmers should compare the cost of corn and cob grinding with the cost of shelling and, where this is necessary, subsequent cracking. For some pigs feeding maize on the cob is more economical.—H. Wenholz, Special Agricultural Instructor.

Mixed Farming on the Middle Rivers.

The Problem of Maintaining Fertility Under Heavy Cropping Conditions.

J. M. PITT, H.D.A., Senior Agricultural Instructor, and W. H. BROWN, Editor of Publications.

With rich alluvial soils that are 10, 15 and even 20 feet deep, with rainfalls ranging between 35 and 45 inches per annum, and with humid temperatures under which almost anything will grow in profusion, one would suppose that any talk of maintaining fertility or conserving moisture on the rich river lands of the "Middle Rivers" of New South Wales would be somewhat extravagant. The magnificent crops that for nearly 80 years have been harvested on some of these areas have no doubt encouraged the idea that the store of fertility is inexhaustible, and that 80 bushels of maize per acre, eight or ten cuts of lucerne per season, and milk and cream in plenty summer after summer can be looked for indefinitely.

But the farmers of these fertile lands have learned that good husbandry is as essential here as anywhere else. They have learned that notwithstanding the depth and richness of their alluvial soils, cropping cannot be continued year after year without reduced yields, that, notwithstanding the heavy rainfall, cultivation methods that will conserve moisture and enable plant-food to be elaborated in the soil in readiness for a crop must be adopted, and that, notwithstanding that paspalum clothes the countryside feet deep in summer, change of pasture and a more varied grazing ration are essential to substantial milk and cream cheques. Unnecessary as these methods would have appeared to the River farmers of ten or twenty years ago, they are to-day assented to as sound practice by a majority and are followed by all progressive men.

For their practical application there are quite a number of farmers to whom reference might be made, and lately opportunity was taken to gather a little from two in particular—Mr. R. Richardson, of "Bellevue," Mondrook, and Mr. J. P. Mooney, of Dumaresq Island—while a few hours were also spent with Mr. Alexander Smith, of Bandon Grove, near Dungog. The first two of these three farmers are practising mixed farming on the banks of the Manning River, broom millet and maize being their most important lines, though both are also dairying, the grass pastures being supplemented with fodder crops, so that the stock-carrying capacity of each farm far exceeds the capacity of the pastures alone. Mr. Smith, located on the Williams River, is essentially a dairy farmer, the whole of his produce being marketed in the form of milk and cream, to which a round of fodder crops contribute as an essential part of the programme.

A Manning River Farm.

Of the 112 acres that make up Mr. Richardson's farm, half is typical of the best river flat land, while the balance rises to the adjoining uplands that commonly overlook these rivers. The alluvial land is devoted to the millet, maize and lucerne crops, and to the growing of the fodder crops, while the higher ground is chiefly under grass. Though so deep and rich, the alluvial soil has long since manifested that thorough and early cultivation, together with rotation of crops, and occasional periods of "rest" under grass or lucerne, yield the best results, and though fertility is so great the use of fertilisers, of leguminous crops at times, and the ploughing in of crop residues give good results.

The crop to which pride of place is given on this farm is broom millet. "The twelve acres of this crop are worth more than the thirty acres of maize," we were told, and, as might be expected, the farm practice is directed in various ways to favour that crop. Millet has a marked preference for clean ground that has been well worked. Mr. Richardson thinks it does better after maize than even after a legume, but this is not general experience, the best results being usually obtained after a legume. It has been remarked here that fertilisers applied to a previous crop often have a marked effect on the millet. The advantages of early ploughing are also appreciated here, a fallow of three or four months being obtained by ploughing early in the autumn, which enables moisture to be conserved and plant-food elaborated before sowing. Partly because this heavy land can do with a lot of working and partly because repeated heavy winter rains beat down the surface, a second ploughing is given during the winter. Some farmers make the mistake of going almost as deep with the second ploughing as with the first, but it should be remembered that this has the effect of burying deeply the soil that has been sweetened on the surface, and the second working should not require to be more than 2 to 3 inches deep.

The roller receives a good deal of use on this farm. The soil is inclined to form clods, and with a view to crushing these the roller is used somewhat freely. Happily Mr. Richardson has learned that the surface must not be left thus, but that the harrow must always follow the roller. Another harrowing is given just before the seed is drilled in, but following the sowing the roller is again used, the object probably being to give a firm surface in which moisture will rise and germinate the seed readily. It might be remarked that such treatment is apt to reduce the soil to a harsh condition, the effects of which are not limited to one season. Moreover, it sometimes happens that heavy rain follows sowing, and the additional beating down of the surface on top of the rolling may make another sowing necessary, in which case, with a repetition of the programme, there is danger that the soil will become even more ill-conditioned. The roller is no doubt a useful implement, but it requires to be used with judgment.

The millet seed is drilled in at 4 lb. to 5 lb. per acre, in drills 3 feet apart, with hills of four or five seeds each about 15 inches apart, using a 10-hole plate and 9-inch sprocket wheel, and as millet is rather a delicate plant in its younger stages, 1 cwt. of superphosphate is applied to give it a good start. By the time the crop is heading out the superphosphate has probably done its work, and some farmers are adopting the practice of a second application of superphosphate at that stage with a view to further stimulating the plant. The yield at "Bellevue" last year was 6 tons of fibre, plus 3 tons of seed, a very wet season reducing the latter part of the crop.

The preparation of the land for maize is on similar lines. Mr. Richardson again emphasised the value in his mind of thorough ploughing and early preparation of the land, as this enables the seed to be sown immediately other conditions are favourable and without the delay that is inevitable if things are left till just before sowing. Much emphasis is laid on the importance of always being ahead of time. "If you get late one season, you don't seem to catch up for years."

Maize is planted in drills 4 feet apart and 3 feet or 3 feet 6 inches apart in the drills, and three or four seeds per drop. The planter used opens the drill, drops the seed, and then covers it lightly, leaving some of the depth of the drill to be filled in later. When the crop is a few inches high, the roller is put over it with the object of filling in the drills, breaking dry clods, and smothering the first growth of weeds. Thereafter further cultivations are given to hill the rows, keep the ground clean, and kill the weeds, the general system being that known as "flat cultivation."

The variety chiefly grown is Golden Beauty. By selection over a period of fifteen years and the introduction at times of seed from good strains of the variety from other farms, it has been much improved until it has reached a good standard. With a mechanical husker and thresher driven by a 3½ h.p. oil engine, the handling of the crop in the barn has become highly economical; the pure seed business, which was profitable at a few shillings per bushel more than for the bulk of the grain when hand-husking was practised, has been pretty well relegated to the limbo of the past. Manning River White has also had selective work bestowed on it with considerable advantage as to type and yield. The earliest variety used on the farm is Golden Superb, which has only lately been introduced but which is doing well. One growing crop was estimated to yield 100 bushels per acre.

The product that may be said to be third in importance on the farm is that of the herd of thirty dairy cattle. It involves the management of 50 or 60 acres under pasture, and the growth of the fodder crops that provide large quantities of feed. A sequence of fodders is made available throughout the year, beginning in the winter with wheat, oats, and barley, after which Saccaline supplies feed for a few weeks. Two or three successive blocks of field peas are sown each winter, and sometimes these legumes are sown in combination with the winter cereals, field peas and Sunrise oats proving

particularly suitable. These successive winter-grown crops keep the herd well fed in the latter part of the winter and until the end of September or even later.

Following late-sown winter fodders, lucerne and successive crops of early-sown maize supplement the pastures during the spring, summer, and autumn months. The pasture on this farm consists mostly of native grasses which are poor in comparison with the richer paspalum areas of the district, and it is profitable therefore to adopt an extensive hand-feeding programme that continues throughout the summer. Even where the pastures are of the best, however, it is profitable on the coast to supply variety by feeding throughout the year, and coastal farmers are familiar with the labour involved and also with the profits attaching thereto.

The Manning River--Mondrook on the left.

The opportunities which a fodder programme like this offer for introducing renovating crops on the millet and maize lands are evident. Field peas, for instance, answer well to such a dual purpose. They can be sown a few weeks after the millet stalks have been raked up and burned, and will provide excellent feed in the winter, an inexpensive method being to draw the growth off the ground in large bundles by means of the hay rake and to cart it to the cattle. It can be fed quite fresh in that way or can be allowed to dry off slightly, when it becomes a somewhat rough pea hay. Whether such a practice pays does not depend alone on the value of the feed. Mr. Richardson estimated the cost of planting a six-acre block of field peas at £9 (allowing £3 3s. for seed, and £6 for six days' ploughing, sowing and cultivating), or 30s. per acre—for which small sum, plus five months' use of the land, he had at least 3 or 4 tons of green feed per acre, and a much improved soil for the maize crop which was to follow. Subject to soil and other conditions being favourable, the field peas are sometimes grazed off, and it is found that though the cows may be a bit slow in starting to feed (and even slower with cowpeas) if they have come off sweet stuff like maize or Saccaline, in a day

or so they settle down and clean up the crop. The residues of the peas are ploughed under and the humus content of the soil thus increased. In this connection Mr. Richardson again emphasised the importance of not delaying ploughing too long. "It is a mistake to wait too long to clear up the last bit of feed. Better lose some of the peas and plough them in than lose valuable time in preparation of the land." Manifestly the loss of a little feed under such circumstances can be regarded lightly. In any case "we go on the line that it is better to have too much feed than too little. It means, too, plenty of stuff to plough under. We are turning something under all the while here. You get it back another season." All of which is sound in principle, and thoroughly safe in practice.

It might be added that the method of renovating maize land with field peas has also been followed on the Macleay River for years, farmers there sowing the seed in February and March, ploughing the residues under in July, and planting the main maize crops between the latter part of September and November. This is harvested in May and June, and the land is ploughed at once and left in fallow for a couple of months until an early variety, such as Golden Superb, can be sown in August and September. The harvesting of this crop in January is followed by the sowing of peas again in February-March. Thus a renovating crop is introduced every second year, and the fertility of the land can be maintained almost indefinitely.

Experience at "Bellevue" shows that something more than even change of crop and the occasional introduction of a legume is an advantage, and Mr. Richardson has found the value of spelling the land at intervals of four or five years. Grass is the usual alternative to a succession of crops on the Rivers, and some handsome yields of maize following a few years of grazing can be mentioned by farmers on this part of the coast. In fact, generally speaking it is better to sow permanent pasture for a few years (including a liberal amount of clover) where rich lands have been temporarily impoverished by over-cropping.

Mr. Richardson considers lucerne an even better alternative as giving a more valuable crop than grass, and leaving the soil in better condition for the maize. Consequently lucerne usually occupies about 10 acres on this farm, and one paddock was specially pointed out where the soil was in excellent condition and carrying a fine crop of maize, a stand of lucerne having been quite recently broken up and the land returned to cultivation. In general practice it is wise to keep away from land that has become infested with paspalum when lucerne is being sown, and to prevent the intrusion of paspalum into the lucerne by reserving a strip round the stand for furrow crops. Lucerne is an expensive crop to get established, and it should be protected from the intrusion of paspalum and weeds, with a view to ensuring it as long a life as possible.

The great depth of soil, the heavy rainfall, and the long summer combine to produce excellent crops of lucerne every year. Hay-making is risky on the Rivers owing to the frequent rains, but the leafy quality of the product

and the haymaking methods that the climatic conditions make necessary give local farmers the feeling that some day the Rivers will grow considerable quantities of hay for other districts.

Superphosphate as a top-dressing for lucerne is attracting much attention and Mr. Richardson applies 1 cwt. every year. The effect was apparent at one spot where alternating strips of luxuriant growth and of thinner growth with distinctly lighter colour advertised the patches where the superphosphate had fallen a bit thick and where it had missed altogether. A stand of lucerne on this farm lasts for about six years. By that time paspalum and couch have got such a hold that there is nothing to do but to plough the lucerne out and put in some other crop.

Thorough preparation of the soil along the lines already indicated is made for a sowing of lucerne, a fine tilth being obtained by ploughing and rolling before the 15 lb. of seed per acre is sown and covered with a light harrow, and finally rolled again. Whether so much rolling tends to preserve tilth and really makes for a better stand is rather questionable, but the practice on this farm of breaking the surface with the springtooth cultivator each winter and again each midsummer during the life of the stand must materially help to keep the lucerne in good heart, while the 1 cwt. of superphosphate which is applied yearly is another factor of importance in prolonging its utility and increasing its fine crops.

A good many farmers in this part of the State already know that there is no reason why their soils should ever become worn out, a few years under grass being all that is needed to maintain fertility, but how much better lucerne is for such a purpose is coming to be realised.

"A Little Farm Well Tilled."

Mr. J. P. Mooney's farm of 46 acres stands on the western end of Dumaresq Island in the middle of the Manning River.

The general scheme here is very similar to that at Mondrook, maize and millet being the principal crops, while a dairy herd of twenty to twenty-five cows has the grazing of about 10 acres of pasture, plus the feed from several acres of lucerne and fodder crops. Here, as in the previous case, the fodder crops are made the change and renovating crops by which are ensured the fertility, tilth, and freedom from weeds that contribute to the best results from the more important crops. Crop remainders of maize, millet, and winter cereals are ploughed under, but field peas are also grown and ploughed in. In fact, Mr. Mooney says, "I find it well to grow peas every year. It is wonderful the results obtained with millet after peas." The capacity of these heavy river bottom lands for transforming vegetable matter into humus can be illustrated by quoting a paddock which in June, 1924, was sown with field peas. The growth was remarkable, and by the end of August the crop was 15 to 18 inches high. As the cattle do not appear to relish this class of fodder, it was, as usual, ploughed in at the beginning of September with an

8-inch double disc. When the land was shallow ploughed at the end of the same month there were no peas to be seen—so quickly had they become incorporated with the soil. The method is one that river farmers can hardly overdo, for their soils, though so rich in humus, require the constant addition of vegetable matter if there is to be no decline of that essential constituent.

The soil of this farm is typical of the river bottoms, but rather freer working than that on the farm described above, and, small though the area is, it fully employs two men—" and no eight-hours per day, either "—as well as claiming the help of the younger generation for the milking. In value the land would at once be quoted at £80 per acre, but it is very doubtful if even a higher offer would attract the owner. The Manning River seed maize contest has been planted here for several years, and Mr. Mooney has become impressed with the heavy yields that attend the very careful methods of preparing the land, planting the seed, and cultivating the crop, which are practised in

More Typical River Country on the Lower North Coast.

connection therewith. Last year the yields on the competition plots were so much heavier than those on the rest of the farm that Mr. Mooney has decided to reduce considerably the 20 acres hitherto planted, and to adopt the more profitable methods on the smaller area.

The preparation of the ground for a maize crop is begun early, the advantages of a period of fallow being fully realised. Generally the land is clear in May and the plough is put in at once to a depth of 9 or 10 inches. While Mr. Richardson's preference on his heavy land is for the disc plough, Mr. Mooney prefers the mouldboard, though where weeds or rubbish are abundant the disc is always used. This strong ground forces tall growth, and stalks 8 and 9 feet high have been turned under with the disc, the chopping roller having first been used to cut them up. Generally the land is allowed to lie in the comb until September, when it is lightly ploughed again before sowing.

After a crop of peas has been ploughed in and the ground springtoothed, the seed-bed is so loose that "it is a job to walk on it." The roller once had a place on this farm, but it has been largely put aside in recent years, a freer surface being now preferred for seeding purposes.

For the maize crop the drills are made 4 feet apart, and four seeds are dropped every 3 feet. Superphosphate is applied at the rate of 1½ cwt. per acre, and in the belief that the hand is more even than the manure box on the planter the fertiliser is applied by hand along a shallow drill which has been first struck with the plough, and covered at once with a cultivator. Before the crop is up a light harrowing is given, and later on a cultivator with 2-inch points is run over the ground a couple of times. Just before hilling, nitrate of soda is spread along the rows at the rate of 1½ cwt. per acre, and is covered by the hilling operation. A few weeks later the middle of the drill is taken out with the cultivator, and with the object of conserving moisture a couple more cultivations may be given before tasselling. "A lot of people are careless about surface cultivation," said Mr. Mooney, "but I find we must keep on cultivating to prevent loss of moisture by evaporation. It is wonderful how quickly the ground dries up with a westerly wind here."

Under the influence of the farmers' experiment plots and of the seed maize contests, farmers on these rivers have taken a new interest in the subject of varieties in recent years. Fitzroy has been Mr. Mooney's favourite for years past, and he has been very successful with it, winning twice in maize contests—once with 118 bus. 22 lb. on the Manning, and once with 86 bus. 50 lb. on the Macleay—and topping all Fitzroy plots in the Manning and Macleay competitions on a third occasion. To achieve such a result, seed selection has been practised for a good while, the characters as to which care has been chiefly exercised being uniformity, trueness to type, depth of grain, and breadth of grain on the top.

The value of a combination of several strains as a means of improvement and of obtaining greater virility has often been observed. It came prominently to the fore on one occasion on this farm, when seed was selected from five different crops of desirable types, the grains being mixed and sown as one sample. The result was a marked increase in the depth of the grain and especially in the length of the cob. Selecting the best cobs from this crop again a yield was obtained the following year which beat the farm strain. Selection in the field has so far not been practised here, but its value is admitted, and it will be adopted—some day.

Red Hogan is another variety to which attention has been devoted, and in one year the Manning maize contest was won with a yield of 120 bus. 49 lb.; latterly Leaming and Funk's Yellow Dent have been found good yielders, the latter being especially useful as an early variety.

Broom millet—a better proposition the last few years than maize—generally occupies 5 or 6 acres on this farm. The same methods of preparation are practised as in the case of maize, and superphosphate is always supplied.

Contrary to the experience at Mondrook mentioned above, it is found here that millet does excellently after field peas, giving a great length of hurl. The millet plant is a little delicate at the start, but comes well once it is established Hurl of fine length and quality is produced, and 8 to 10 cwt. per acre is reckoned a good yield, which, with prices at £40 to £43 according to quality, should leave the grower a margin.

On the dairying side, progressive ideas are entertained in relation to the herd, to the pastures, and to the fodders On the principle that "if ten good cows will yield as well as twenty of the other sort, why milk twenty," the herd is being gradually reduced in numbers but improved in quality. With the hope of establishing a small herd of Guernsey pure-breds, a few animals of good pedigree and promise have been purchased from Wollongbar Experiment Farm.

Already hand feeding is practised 365 days in the year—always once a day and sometimes three times—and one man's time is almost fully occupied in this way. A forward move is contemplated in this direction too. In order that a better and more nutritious ration may be provided for the cows, three blocks of mixed grasses as suggested by Mr. J. N. Whittet, Agrostologist of the Department, have been laid down, and will be fenced in, so that they can be fed off or spelled as desired. One of these blocks, which comprises 4 acres, has been sown with a mixture consisting of 10 lb Perennial Rye grass, 6 lb. Cocksfoot, 10 lb. Prairie grass, 3 lb. Red clover, and 1 lb. lucerne per acre, Two smaller blocks have also been laid down, the mixture in one case consisting of 6 lb. Wimmera Rye grass, 1 lb. *Phalaris bulbosa*, 4 lb. Tall Fescue. 2 lb. Perennial Red clover per acre, and in the second of 2 lb. Tall Oat grass, 6 lb. Cocksfoot, 8 lb. Perennial Rye grass, and 1 lb. Subterranean clover per acre. The effects elsewhere of superphosphate as a top-dressing for pasture have produced an impression here, and applications will be made from time to time in the history of these small pastures.

Concurrent with this the area under paspalum is being reduced, while that under lucerne is being increased. Already there are on the farm a couple of blocks of lucerne—"the dairy farmer's friend"—and though one of them is eleven years old it is still making wonderful growth every year. "If you don't want the lucerne now," says Mr. Mooney, "you've got the shed you can put it in." Accordingly in addition to feeding a good deal of lucerne throughout the summer, something like 20 tons of hay are stored each summer and form an essential feature of the winter ration.

The lucerne stands are cultivated with the springtooth cultivator every winter and 2 cwt. of superphosphate is applied as a top-dressing at the same time. The benefits attaching to this treatment have been marked, the growth being increased and the quality of the hay improved.

The feeding programme on this farm bears a strong resemblance to that at "Bellevue." Wheat and oats supply green feed during the winter and early spring, but field peas, whether grown by themselves or in combination with the

winter cereals, do not appear to be relished by the cows and hardly figure in the fodder list at all. Saccaline, a fattening feed, though not much good as a milk producer, furnishes variety throughout this period, but it is a factor in keeping the cows in good condition, so that they are ready to begin milking heavily in the spring. Lucerne hay is ever available. In September a start is made with the sowing of maize, and it is fed continuously throughout the summer and autumn, one crop coming in after the other for the purpose. Several varieties are grown in the early part of the season, but when it comes to the planting of Fitzroy for the grain crops the sowing of all other varieties is stopped, and even for fodder purposes Fitzroy is sown, so that the purity of the main grain variety on the farm may be preserved.

How Maize Grows on the Lower North Csast.

The place of pigs on the coastal farm has been well tested here. They were kept at one time to utilise the skim milk, but when an opportunity came of selling whole milk the pigs were dispensed with. However, circumstances having altered pigs have been restored, and with experience of both systems Mr. Mooney is rather better pleased to sell the cream only and keep pigs to use the skim milk. He believes the latter is the more profitable, and as it also means that maize, millet seed, lucerne, and other products are consumed on the place and eventually marked in the more valuable form of live pork, there is no disposition to change again, the more so as money has been expended on breeding stock of good type.

On River Flat and Steep Hillside.

With a total area of about 100 acres, of which 40 acres are on the banks of the Williams River, while the balance rises steeply to the top of the ridge that separates the river from a tributary, the problems that confronted Mr. Alexander Smith of Bandon Grove bear a strong resemblance to those of

many dairy farmers between the Paterson and the Clarence. Of the flats, Mr. Smith describes 20 acres as first class agricultural land, admirably suited to the cropping that augments the carrying capacity of the whole farm. With the exception of a little maize, lucerne, skim milk, &c., marketed as poultry and pig products, practically the whole of the output of the place is sold in the form of milk or cream. The maize, Saccaline, wheat and oats, lucerne and other legumes, are all fed to the cows on the flats, and are literally carried by them uphill to the bails and dairy on the top of the ridge.

The herd itself is a very attractive one, consisting of pure-bred and grade Jerseys of nice even character, of which half are in the herd book. In an average season something round thirty-six animals are milked, and their condition and quality advertise the care bestowed upon them and the judgment exercised in the breeding.

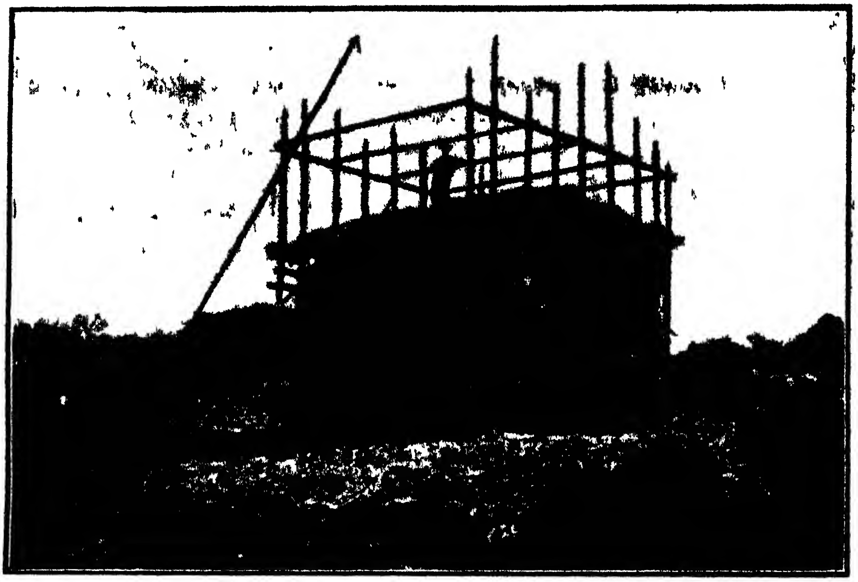
Though the grazing areas on this farm furnish good summer grasses, hand-feeding goes on the year round, beginning in the latter part of the winter and spring with winter cereals combined with vetches or peas, after which successive crops of maize, and perhaps a little lucerne, help to supplement the pastures till the autumn, when Saccaline, chaffed and mixed with bran or linseed meal or lucerne hay, take their place for two or three months.

With a limited area for the production of so much feed, it is essential that the crops follow one another in proper rotation. These flats have been under cultivation for perhaps seventy or eighty years, and soil exhaustion is only avoidable by the adoption of sound methods of culture. Accordingly, in addition to the ploughing in of residues of all crops, legumes have also been grown at times and ploughed in, "undoubtedly with good results," we were told. Legumes are also a prominent feature in the fodder cropping, being grown in combination with both winter and summer crops. They greatly improve the quality and increase the quantity of the feed, and act as soil renovators, adding to the value of any residues ploughed in. The soil here tends to run together rather readily after rain—one block intended for maize last season had to be cultivated sixteen times before the crop was sown—and the addition of vegetable matter greatly improves it in this respect. Land placed under pasture for two or three years has also shown a great improvement when broken up again for cultivation.

Experiment plots have been sown in co-operation with the Department for several years. This year wheat and oats with vetches and peas in varying quantities were sown on 26th March, and some plots were 2 feet high at the beginning of June; risk of lodging apart, some would probably grow 6 feet high before being cut. On the whole oats seem to be more appreciated by the cattle, and Algerian, Sunrise, and Mulga have all been grown with good results. Currawa appears to be the most palatable of the wheats.

These winter cereals and legumes are generally cut and carted out and spread on clean spots in the paddocks, though sometimes they are put through the chaffcutter, and at times are mixed with lucerne hay, the green stuff apparently encouraging the cows to eat the hay.

Though the addition of legumes to the winter cereals increases the cost of the crop appreciably, Mr. Smith is quite sure they pay, and he includes them every year. Similarly cowpeas certainly add to the price of the green maize fodder in the summer, but they are always included, being generally sown by hand along the drills of the early plantings, and in the drill with the later plantings. The cows do not take to the cowpeas at first, but once they start eating them the improvement in the milk supply is immediate and emphatic. "They have a wonderful influence on milk supply on the dairy farm," said Mr. Smith.



Silo Stack on the Farm of Mr. A. Smith, Bandon Grove.

Two stands of lucerne totalling 5 acres, one having been sown about 1916 and the other a year or two later, yield quite six cuts per year and sometimes more. Usually the lucerne is grazed lightly in the winter and spring; the first growth of the year is not the best for hay purposes, and is generally utilised in that way. Lucerne must always be grazed with care, and the practice here is to put the disc cultivator over the ground after the stock are removed and then the springtooth cultivator. The stand looks none too well after such treatment for a while, but with the annual application of a bag of superphosphate per acre and the advent of warmer weather it picks up again. The lucerne is allowed to grow a bit longer here than on the average farm before it is cut. Certain Wisconsin authorities have suggested that if the growth is allowed to grow until it is approaching full bloom, rather than when only one-tenth is in bloom, the stand will last longer, though the total quantity of fodder cut in each season will be the same. Mr. Smith has

followed this newer method, and thinks the contention is perhaps right. The feed is not of such good quality, perhaps, as when cut younger, but if it is being fed on the farm that is not of great importance.

Saccaline is a favourite on this farm, several acres being grown every year. Bran or linseed meal is usually supplied with it, but this year lucerne hay has been used to improve the quality of the ration. An interesting example of the way in which cattle will unconsciously balance their own ration was afforded early in the past winter. The quantity of lucerne required to make a balanced ration was calculated and put out, but each day a substantial portion was not cleaned up, presumably because the clover portion of the pastures was good and the proportion of hand-fed protein required was, therefore, smaller than anticipated.

The methods of putting the fodder out to the cows here are inexpensive but efficient. Mr. Smith attaches a value to the time of the cattle, and chaffs the Saccaline so that the animals may consume the given quantity in as short time as possible, and so be able to spend the longer time grazing. On the occasion of a recent visit two men were chaffing Saccaline and putting it out, chaffing sufficient fodder for two days in about forty minutes. The cows cleared up their daily portion in about half an hour, whereas in the stalk it would have taken them three hours. Thus for two men's work for twenty minutes per day, thirty-six cows were enabled to spend an extra two and a half hours each on the grass—or a total daily gain of ninety hours' feeding. The argument may be novel, but its arithmetic is undeniable, and Mr. Smith reckons it is too profitable for serious question. After being chaffed the feed is drawn out on a slide and thrown off the tail on clean pasture, that being found the cleanest and cheapest way of handling it. The cattle clean it up to the last item before returning to the grass.

Maize is grown in a small area for grain, and successive plantings are also made to furnish green fodder during the summer, and to enable silage to be made. The stack is the method chiefly adopted for making silage, satisfactory results being obtained by building the stack inside poles as suggested in the *Gazette* in November, 1919. In the case of the stack illustrated on page 734 loading was at first attempted with the whipstick, but it did not work well, and finally the green stuff was tied in bundles and hauled by horse-power up sloping poles by means of a rope thrown over the stack.

In a desire to discover an inexpensive way of conserving small quantities of surplus fodder, a pit silo was constructed last year on the flat. For the conditions it is somewhat of an experiment, but the barn was almost full and the weather was too wet any way for hay-making. Roughly about 35 tons of greenstuff was ensiled, chiefly from 2 acres of Sunrise oats with which field peas and some vetches had been grown; the first cut of some lucerne was also put on top. The pit (44 feet long, 12 feet wide, and 6 feet deep in the middle) has yet to be opened, and the fodder will be closely scrutinised when the day comes.

The better way—a properly constructed overhead concrete silo—is illustrated in Mr. E. W. Alison's yards quite in the town of Dungog. The silo—capable of holding 110 tons of feed—is filled every year with chaffed maize, which is fed out with chaffed green Saccaline in feeding troughs in the bails. As reducing the hand-feeding of a large herd to a minimum, the equipment is worthy a visit by all farmers in the district, even though lack of capital may limit the adoption of the system in certain respects.

To return for a moment to Mr. Smith's property, we may draw attention to the top-dressing experiment conducted there, as recorded by Mr. Whittet in the *Agricultural Gazette* of May last, page 339. Four different applications were made on defined areas, and comparisons were made with plots which received no treatment at all. All the top-dressed plots showed a marked improvement over the unmanured ones, especially those on which superphosphate (188 lb. per acre) had been used. The advantage was still most evident twelve months after the applications, not only in the increased growth of grass, but in the improved quality of the feed, due to the presence of a larger proportion of clover—encouraged, of course, by the superphosphate.

A Bulletin for Bee-keepers.

According to a statement in an American publication, no primary industry has made such rapid progress in that country during the past twenty years as apiculture. There is ample scope for such an advancement in New South Wales. One trouble in this State is that there are too many people who "keep bees," and not sufficient bee-keepers in the true sense of the word. If everyone who kept bees did so with the intention of becoming a competent apiarist the industry would soon develop into one of very appreciable dimensions.

The competent apiarist must have a sound knowledge of bees and their habits, and, while practical experience is essential in this connection, reliable guidance is not of less account. Those intending to make a start with bee-keeping this spring are recommended to purchase Farmers' Bulletin No. 129, "The Beginner in Bee Culture," obtainable from the Department, or from the Government Printer, Phillip-street, Sydney, for 10d., post free.

Charcoal for Chickens.

There are but few poultry farmers who do not supply charcoal to their chickens. This is all right up to a point where something happens. As long as the chickens only take what is good for them, charcoal is not harmful and is generally beneficial, particularly if there is any appearance of intestinal trouble, but many cases come under notice where the chickens develop such a liking for charcoal that they eat too much of it, causing intestinal impaction. In such cases charcoal should be taken away from them. As a matter of fact, charcoal is not absolutely necessary, except in the case of the troubles referred to—Jas. Hadlington.

Farmers' Experiment Plots.

GREEN FODDER TRIALS.

South Coast.

R. N. MAKIN, Senior Agricultural Instructor.

MAIZE and sorghum sown for green fodder and silage purposes were again tested out on farmers' experiment plots during the season 1924–25. In the maize section a manurial trial was carried out in which the various classes of superphosphate were tried with a view to obtaining information regarding their respective values on different soils and in different climates.

The following farmers co-operated with the Department in this work :—

J. W. Childs, Mount Hunter.
A. Chittick, Kangaroo Valley.
J. E. Richardson, Jamberoo.
Bate and Meade, Bodalla.
A. Louttit, Moruya.
K. Jackson, Foxground.
G. H. Faulks, North Yarrunga.
Boys' Farm Homes, Mittagong.

The plots were set out in sections on which basic superphosphate, high grade superphosphate (45 per cent.), and ordinary superphosphate (36–38 per cent.) were applied at the rate of 2 cwt. per acre, an untreated section being also included as a check. The variety of maize throughout was Fitzroy, which was seeded at the rate of about 30 lb. per acre, 2 feet 6 inches between the rows. Different classes of soil were represented, from the rich flat ground of Bodalla to the poor type as found at Mittagong. At Bodalla the soil has been built up from sedimentary deposits, and this particular plot has not been under the plough for many years. Former experiments on good class soils have proved that it pays to use fertiliser. The results of the experiments on this occasion qualifies those former trials. At Mount Hunter, Mittagong, and North Yarrunga the soil is formed from sandstone, at Jamberoo and Foxground from basalt, at Kangaroo Valley from sandstone and basalt, and at Moruya from granite. The rainfall was irregular, though the total was above the average in most cases.

The spring was good and the weather continued good until the middle of January, when drought conditions set in and the plots in some instances were considerably checked, especially at Mount Hunter and Jamberoo. Where the sowing was somewhat late, as at Foxground, the flood rains in April and May affected the crop so much that at the place mentioned no returns were taken owing to the fact that it was not possible to get on the ground.

From the table below it will be seen that at Mount Hunter the effect of the fertiliser was not felt by the crop, owing to the rain not coming until just before harvesting, a stage when the plants could not benefit. At North Yarrunga, owing to soil variation, the plot treated with ordinary superphosphate was disappointing in yield; otherwise the returns were satisfactory, showing the manuring to have been commercially profitable. Comparison of the effect of the different classes of superphosphate does not show a great deal of difference, and no definite recommendation can be made on the one season's work. It is frequently difficult to determine the benefit derived from the use of superphosphate from the height and perhaps other external appearances of the crop. At Bodalla, for instance, the whole crop, manured and unmanured, averaged about 13 feet in height, and it was only on cutting it out that the better leaf development and colour of the plants from the manured plots was apparent.

RESULTS of Manurial Trials.

Fertiliser per acre.	North Yarrunga.	Mittagong.	Mount Hunter.	Kangaroo Valley.	Jamberoo.	Bodalla.	Moruya.
Date sown	28/10/24	19/11/24	4/11/24	20/11/24	29/11/24	9/12/24	31/10/24
Date harvested ...	30/4/25	27/3/25	31/3/25	24/4/25	24/5/25	21/4/25	22/4/25
Rainfall	2,501 pts.	1,849 pts.	1,510 pts.	1,735 pts.	....	1,713 pts.	2,524 pts.
	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.
2 cwt. superphosphate, 36/38 per cent.	10 0 0 0	25 1 0 3	13 11 1 20	24 7 0 16	14 5 3 6	32 3 3 4	16 5 2 24
2 cwt. superphosphate 45 per cent.	14 [illegible] 2 20	[illegible] 1 0 3	13 11 1 20	26 8 2 8	13 11 1 20	40 5 2 4	22 17 0 16
2 cwt. basic superphosphate.	15 4 0 12	19 8 1 16	13 11 1 20	23 11 1 20	13 4 1 4	38 5 2 24	18 11 1 20
No manure	12 0 0 0	14 10 1 17	13 2 3 12	22 2 3 8	11 8 2 8	31 5 2 24	14 11 1 20

Sorghum.

Trials were made with different varieties of sorghum in Camden, Illawarra, and Bega districts on the properties of the following farmers:—

J. W. Childs, Mount Hunter.
L. Evans, Dapto.
T. Kelly, Tanja.

The object of the experiment was to test the different varieties for their value for feeding in their green state to cattle. The demand for such feed occurs generally late in the winter as far as dairy farmers in the South Coast district are concerned, so it is late-maturing varieties that are in demand. Several of these were under test in a previous variety test and promised to be very useful, especially White African. As early-maturing varieties are very little in demand and, as far as South Coast conditions are concerned, are subject to the ravages of the red stain trouble, they will be excluded from further trials.

Weather conditions were much the same as those affecting the maize crops. The soils on which these trials were conducted are formed chiefly from sandstone.

At Dapto, and also at Tanja, owing largely to the heavy and continuous rains experienced during April and May and the difficulty of getting on to the ground, all the plots were harvested on the same date, namely, 6th July and 2nd June, respectively. At Mount Hunter the varieties were harvested as follows:—Red Amber and Orange, 31st March; Sorghum No. 34, 17th March; Honey, 8th April; Darso, Bolong, Gooseneck, 20th April; Sorghum No. 61, 21st April; Saccaline and White African, 30th May; Collier, 3rd June.

All the farmers were of the opinion that for their requirements the White African variety was much the best of the varieties under test. This variety attracted attention in a previous test. It is much the latest in maturing, and there is some difficulty in getting it to ripen its seed, unless planted earlier than is usual in planting for winter feed; when grown for seed a planting should be made in October. At present there is no seed of this variety obtainable on the open market, and the Department's supplies are required for further experiment. A few farmers, on whose properties previous experiments have been conducted, hope to have a supply of seed next year.

Gooseneck is another variety that may possibly be found of value as a late variety, but seed of this also is in limited supply.

As far as South Coast farmers' requirements are concerned, Sorghum No. 61 and Saccaline are still the most dependable varieties of which seed is available.

Red Amber, Orange, Sorghum No. 34, Darso, and Bolong will be excluded from further trials, as the other varieties are superior in meeting the requirements of the stock feeder.

RESULTS of Variety Trials.

Variety.	Mount Hunter.				Dapto.				Tanja.			
Date sown	6 Nov., 1924				31 Dec., 1924				6 Nov., 1924.			
Rainfall	2,690 points.				3,847 points.							
	t.	c.	q.	lb.	t.	c.	q.	lb.	t.	c.	q.	lb.
Red Amber	10	11	1	20	22	11	3	4	5	12	3	12
Honey	12	10	0	0	22	11	3	4	5	0	0	0
Orange	11	14	1	4	16	2	0	16	4	10	0	0
Sorghum No. 34	11	17	0	16	28	9	2	16	8	7	0	16
Darso	9	4	0	22	12	19	2	16	5	14	1	4
Collier	14	0	0	0	28	5	1	24	4	17	2	20
Bolong	13	8	0	4	17	1	3	4	5	7	0	16
Sorghum No. 61	12	17	0	16	25	6	3	4	5	14	1	4
Gooseneck	12	12	3	12	25	14	2	16	6	10	1	12
Saccaline	11	2	3	12	17	13	2	8	7	17	3	12
White African	15	0	0	0	27	13	2	8	14	2	2	0

Agriculture is, beyond all doubt, the foundation of every other art, business and profession, and it has therefore been the ideal policy of every wise and prudent people to encourage it to the utmost.—A writer of two centuries ago, "Young" by name.

Electrical Treatment of Seeds.

Various experiments to test the utility of electricity in crop production have been carried out by the Department, an inquirer was lately informed.

In connection with the treatment of seeds, several kinds of vegetable seeds have been tested, but with negative results.

There is local evidence to show that in some cases electrically-treated tomato seed has taken longer to germinate than untreated seed. In one case the electrically-treated seed germinated in *fourteen days*, while the untreated seed germinated in *five days*.

The question of electricity in relation to plants and plant growth is at present undergoing investigation in different parts of the world. The latest available results are to the effect that seed treatment has no appreciable effect on the subsequent character or yield of the plants. In most instances the seeds were immersed in an electrolyte of brine, and subjected to the action of the current. The high-tension electric discharge, however, has resulted in increased yields of a number of crops when treatment was applied continuously throughout the growing season.

Claims have been made that seed treatment by electrical means has resulted in marked changes in the subsequent crops, but these have not been substantiated in carefully-conducted trials, and the matter is for the present in the experimental stage.

Feeding Pigs on Arrowroot.

A North Coast farmer who fed arrowroot to three full-grown pigs, of which two subsequently died, asked whether the losses could be due to the roots.

In reply, he was informed that the Department had never heard of any injury to pigs through feeding on either Queensland arrowroot or blue arrowroot. At Wollongbar, as well as at other farms, the Department has turned the pigs on to the crop and allowed them to dig for the tubers themselves. In other cases the roots have been pulled for feed, but they are always allowed to stand for a couple of days before being fed to the pigs, as the raw freshly-pulled tubers have a tendency to cause purging. Cassava, a variety of arrowroot, has been reported as having a slight amount of alkaloid in the plant, which causes hydrocyanic poisoning, but even this variety is safe to feed to pigs after having been out of the ground for forty-eight hours. Even in the event of deaths being caused by this variety, they would be sudden, and not prolonged over a period.—J. A. Robertson, Herdmaster.

Hygiene in the Piggery.

We are told that there is no animal on the farm that is more likely to suffer from colds, caused by lying on damp floors or in draughts, than the pig; and yet there is none that is, as a rule, so carelessly provided for with buildings. Anything seems thought good enough for a pig-sty, either in design or construction—few, indeed, can be said to have any design about them at all.

A pamphlet on the subject of hygiene in the piggery is obtainable free on application to the Under-Secretary and Director, Department of Agriculture, Sydney.

Make Dairying Easier.

E. O. DALGLEISH, H.D.D., Dairy Instructor.

DAIRYING is looked upon almost universally as an occupation of unending toil and ceaseless drudgery. That it need not be so may be taken for granted, and an endeavour will be made in the following article to show some of the ways in which a dairy farmer may make his lot less arduous. It must be admitted by anyone who knows the dairying districts of New South Wales that farmers as a whole do not take advantage of the many labour-saving devices which are available to them. Many no doubt cannot afford them, but it is equally true that many others can, though they persist in old, laborious ways. At the Agricultural Bureau Conference at Hawkesbury Agricultural College, a few weeks ago, it was stated that the cost of a plant required to farm an area of 640 acres for wheat would be £826. No one starting out on a dairy farm would need to expend anything like that sum, so that when we compare the amount a dairy farmer spends on plant with the amounts other farmers must lay out, it is reasonable to suppose that the dairy farmer is in the more favourable position, and hence with advantage might spend more to reduce his own labour.

Cut Out the Carrying of Water.

The first essential on a dairy farm is a plentiful supply of good water, both for use by the stock and for use in washing utensils, floors, etc. For the latter purpose, it saves many hours' work and the walking of many miles in a year if water is laid on to the dairy and bails from an overhead tank, supplied either by windmill or other power. Most inland farm houses are supplied with overhead tanks in this way, as the rainfall is often uncertain, and tanks supplied from the roof cannot be depended upon. Yet even where overhead tanks are already in use, it is the exception rather than the rule to find water laid on to a dairy. In coastal districts, where the rainfall is heavy, the common practice is for the water caught from the dairy roof to be used for washing down. In dry periods this supply often fails, with a consequent serious effect on the quality of cream, so that even on the coast many farmers could greatly improve their own prospects by installing an independent water supply. The farmer's wife, also, as a rule has not the easiest row to hoe, and to have the water laid on in the house and garden is a very great convenience.

The Modern Milking Machine.

The milking machine plays a very important part both in reducing the labour and expense of dairying, but of course there are "milking machines and milking machines." Most of the faults associated with the earlier makes of machines have disappeared, and it is a fallacy to believe that they injure the cows, or are responsible for a reduced output. Their cost is by no means

great : it is possible to instal a plant to milk two cows at once, or sixteen per hour, for about £90; or to milk four cows at once, or thirty-two per hour, for about £120, including engine. Compare this with the wheat farmer who has to pay £250 for a "header" to harvest his crop! A farmer who instals machines makes it possible to get away for a day or so if he wants to, for most plants now on the market are so simple that a boy can operate them successfully.

The Power-driven or Electrically Operated Separator.

In reducing labour on the dairy farm the separator engine is much in use. Where milking machines are used the engine driving the plant also supplies power for the separator, but in coastal districts many farmers who do not use machines make use of the separator engine—a small unit of about 1½ h.p. —to relieve them of the many hours spent weekly in turning a separator handle. These little engines as a rule perform their work admirably. They are not costly to instal or operate, yet they have features which are hardly desirable, being noisy and liable to taint cream through the escape of exhaust fumes. The latter fault may be lessened with all oil engines by taking the exhaust outlet well above the roof of the building ; in fact, this is now insisted on by dairy inspectors. Electricity is the ideal power to use on the dairy farm, but as yet few farmers have access to either hydro-electric or power-driven electric systems. It is here that science comes to the aid of the farmer in providing the home lighting plant, which consists usually of a kerosene or petrol-driven engine, electric generator and storage battery. These plants have now been perfected to the extent that it is possible to use them for power purposes, such as separating, driving small pumps, or even operating small milking machine plants by means of electric motors. It may surprise many farmers to know that the electric motor is the cheapest in first cost of any form of power, and it is by far the cleanest and easiest to operate. The home power plant is usually automatic—that is, as the storage becomes depleted the engine starts and recharges the system, the only attention required being the supply of oil and fuel. They are very low in running cost, and the cost of the whole outfit is somewhere in the vicinity of £250.

Some farmers spend twice this sum on a motor car, and probably lose as much in a year through it's depreciation. Admitting that to many farmers the car is a necessity, it also must be a necessity to make their homes more attractive and lessen their own hours of labour. The great assistance electricity is to the housewife must not be overlooked. The electric iron, the power-driven sewing machine or washing machine, are only a few of its household helps; and the amount of current taken to drive, say a sewing machine is so small that means do not exist of measuring it, while to all these advantages must be added the great value of electric light.

Farmers perhaps are inclined to look with doubt and suspicion upon electricity—feelings which are hardly justified, for electricity will some day be the farmer's greatest friend. The electric plants which are on the market to-day

are very reliable, being the result of years of experience, and if given ordinary attention they seldom go wrong. Even if they were to give trouble on occasion, most towns now are electrically lighted, and in the towns expert service is always available. Almost every day it is becoming more necessary for the farmer to have a thorough knowledge of machinery, and there are few farms indeed which have not on them some form or other of modern machinery.

Better Methods of Heating Water.

On the vast majority of dairy farms there is room for great improvement in the methods used in heating water. It is probable that of all causes of second grade cream, the washing of separators and utensils with luke-warm water without afterwards scalding is the greatest. The importance of a plentiful supply of boiling water cannot be stressed too much, for only by its use can cleansing be properly carried out. The essential part of "washing up" is the cleansing and sterilising of all those surfaces with which the milk or cream comes in contact. By sterilising we mean the destruction of all germ life, and the only way open for the farmer to do this is to use boiling water. Many diverse methods are in use for obtaining hot water: kerosene buckets suspended over an open fire is one common practice—slow, tiresome, and wasteful of fuel. Numerous farmers use a copper, and unless the copper is bricked in, and by a man who understands the work, this way is nearly as slow and uses nearly as much fuel as the open fire.

A fairly large body of water, such as may be contained in a copper, will take a long time to heat to boiling point. The usual practice is to light the fire under the copper or other heating arrangement when starting milking, and when the milking and separating are done if the water happens to be boiling so much the better, but if not, well, it is used just the same—the results often being, as previously stated, second grade cream.

Sometimes the water is heated over a stove or open fire in the farm kitchen; and one farmer, who had a six-cow milking plant and a large herd, obtained all his water for washing up from the hopper of a water-cooled oil engine. Needless to say, his cream was always second grade, solely through the fact that he was not using anything like the quantity of hot water he should have been.

A cheap and easy method of securing plentiful supplies of boiling water is the ordinary chip bath heater. These heaters, which cost only a few pounds, will supply boiling water in a few seconds, using as fuel any waste material such as old papers, brushwood, or chips. They are best used when connected by piping to either an overhead or rain water tank, or other source of water supply, and it is hard to understand why more farmers do not make use of them.

Another method sometimes used is the installation of a small steam boiler, the steam from which is used to boil water in the wash-up tubs near-by. The boiler, though much more expensive and requiring more fuel, has the additional advantage that steam is available for steaming out cans and buckets

and would be useful on large dairies. For all ordinary purposes on the average farm, the chip bath heater should provide ample supplies of hot water, and where milking machines are in use successful results cannot be obtained unless such supplies are available.

Conclusion.

The foregoing indicates a few of the methods by whi h a dairy farmer may lessen considerably the drudgery of dairying, and, though applicable to the farmers in most districts, should particularly apply to the inland farmer. The inland farmer is seldom solely occupied by dairying. He is usually a mixed farmer, depending for his major income on other branches of farming. He should, therefore, be in a better position financially to equip his dairy so that it can be run with the least possible labour and expense. The great question of course is, "Will it pay?" and an answer to that can definitely be made, that anything which will reduce labour costs and running expenses, turn out a better product, free the farmer's hands for other duties, and tend to render farm life more attractive, will pay, and pay handsomely.

A great deal is said and written nowadays about the drift to the cities, and it is probable that nowhere is this drift greater than in our dairying districts. A reason may be found in the dislike of the younger generation for an occupation which seldom permits of any respite, and too often shows an inadequate return for the labour expended. Yet the remedy for this is in farmers' own hands. Dairying in itself cannot be termed hard work. Constant it certainly is—but by making use of natural advantages where they exist, arranging yards and buildings with an eye to the greatest possible convenience, and utilising mechanical aid in preference to manual labour wherever it is possible, the farmer may be assured of a greater return at less cost, and his children will be more inclined to continue in rural occupations.

No one will deny that the producer is the backbone of the community, yet until local consumption overtakes production high prices can rarely be attained. More profitable returns then can only be realised by producing more without increasing expenses, or by maintaining present production with lowered running costs, and in most districts this is easily possible; while the magnetism which city life exerts would then not be nearly so powerful as it is to-day.

Surface Drainage.

No prudent orchardist neglects this important matter. Many of our citrus and other orchards are situated on land having a more or less pronounced slope, and if adequate provision is not made for surface drainage the orchardist will probably lose a greater or less quantity of soil, and will have channels formed in the orchard during those periods of heavy rain which are comparatively frequent in our climate. Surface drainage must be adequate for even unusual demands, and must be according to the contour of the land. Moreover, the drains must be kept clear. If they become choked, the valuable purpose for which they are intended will be entirely defeated.—W. J. Allen.

Standards of Sheep and Cattle Dogs.

THE following standards for sheep and cattle dogs were recently drawn up by Mr. C. D. Lawrence and Mr. A. A. Blakeney, and have been adopted by the Cattle and Sheep Dog Club of New South Wales, and concurred in by the Kennel Club of New South Wales:—

KELPIE STANDARD.

Head.—Broad between the ears; skull slightly domed and gradually decreasing in width to the eyes, with a decided stop (falling away where muzzle joins skull); a fair length and tapering to a fine point at the muzzle. Teeth to be as level as possible with close lips.

Ears.—Should be short, pricked, leather fairly fine, wide apart, running to a fine point at the tips; inclined outwards with outsides slightly rounded.

Eyes.—Bright and eager looking. To vary in colour from dark brown to light brown according to colour of coat.

Neck.—Strong, full, well set on shoulders, slightly arched, and showing a fair amount of ruff.

Chest.—Deep and fairly broad with well sprung ribs.

Shoulders.—Strong and very muscular, inclined to slope towards hindquarters.

Forelegs.—Clean and perfectly straight, muscular and finely boned.

Feet.—Round, strong, deep in pads, with close-knit well-arched toes and short strong nails; should stand well on toes.

Back.—Should be short and level; loins rather long, slightly arched and powerful.

Hindquarters.—Should be long from hip-bones to the hocks, with stifles well bent to denote speed. The hip-bones should be wide.

Tail.—Should be short, carried down with plenty of brush.

Coat.—Moderately short, abundant, dense and straight, rather soft in texture, with soft undercoat.

Colour.—Black, black and tan, red, red and tan, sable, blue-grey.

Height.—Dogs, 18 to 21 inches; bitches, 17 to 20 inches.

General Appearance.—That of a lithe, active alert dog, capable of untiring work; should be a fair length, graceful, wiry, and muscular.

CATTLE DOG STANDARD.

Head.—Broad between the ears, tapering to point at muzzle; full under the eyes, strong and muscular in the jaws.

Ears.—Short and pricked, running to a point at tip, thick and set wide apart on skull with plenty of muscle at the butts. Ears should be decidedly pricked.

Eyes.—Brown, quick and sly-looking.

Shoulders.—Strong, with good slope for free action.

Chest.—Deep, but not out of proportion with the body.

Legs.—Clean and a fair amount of bone—great muscular development.

Feet.—Small and dingo shaped.

Back.—Straight with ribs well sprung; ribbed up and good loins; should arch slightly at the loins.

Hindquarters.—Strong and muscular with back thighs well let down for speed.

Tail.—Not too long, dingo shaped.

Height.—Dogs, 18 inches to 20 inches (20 inches preferred); bitches, 16 inches to 18 inches (18 inches preferred).

Coat.—Short, smooth and very dense.

Colour.—Blue Mottled: Head, blue black and tan preferred; head, evenly marked; body, dark-blue; legs, dark tan. Red Speckled; Body, red speckled—not white or cream; head, evenly marked.

General Appearance.—That of a small, thick-set dingo.

ARE POPPIES POISONOUS TO BEES?

IN attempting to answer the above question, the Iceland poppy was selected for experimental purposes, as it may be found in numerous gardens throughout the State, and is the poppy most generally grown in large quantity. It flowers during the early spring, and produces a good deal of pollen, which is eagerly sought after by bees at a period when large quantities are required for stimulation of brood rearing. The departmental experiments hereunder described were prompted by the publicity given to the matter last season, the question whether this poppy is poisonous to bees having been much discussed.

It was believed the adult bee was affected after gathering or consuming pollen from the poppy flowers, and our experiments were designed to determine this point. Seven cages (Benton mailing cages) were fitted up and candy was placed in them for food. In the first cage was placed one bee captured from the poppy flowers fully loaded with pollen. The second, third, fourth, and fifth cages were supplied with three, six, nine and twelve bees respectively, the bees having about equal loads of pollen in each cage. It was desired to see how one bee would fare, and also the effect on a number placed in one cage. The placing of one bee in the first cage gave insurance against fighting and mortality due thereto, which might cause a wrong impression. In the two remaining cages were placed as controls bees loaded with pollen from the wattle, there being no doubt about that plant. The bees were kept caged for four days, and at no time during that period did any of them show any sign of being affected. At the end of the second day all the pollen had bsen removed by the bees from their legs, and probably some of it had been consumed. A second test of caged bees, secured under different temperature and in a different locality, also gave a negative result. These experiments indicate that bees are not affected injuriously by visiting and gathering pollen from the Iceland poppy.

In a further test to see if the poppy pollen is injurious to the adult bee, we were able to obtain a small quantity of pollen from the legs of bees captured while working on the plant. This pollen was thoroughly mixed with soft candy, and fed in a cage to young adult bees, but no injurious effects on the bees were noted. All our tests go to prove that the Iceland poppy is not injurious to the exercise of the vital activities of the bee.

The fact that Iceland poppies flower at a period when the disease known as "spring dwindling" is likely to occur among the adult bees, and the knowledge that opium is produced from poppy plants, have done much towards fostering the impression that Iceland poppies might be injurious to bee life.—W. A. GOODACRE, Senior Apiary Instructor.

Control of Black Spot.

Venturia Inæqualis (CKE.) ADERH.

H. BROADFOOT, Senior Orchard Instructor.

THIS fungus disease attacks apples in any locality where favourable climatic conditions are present. It is unfortunate that most of our best commercial varieties, such as Granny Smith, Delicious, and others, are very susceptible to attack; and it is difficult to estimate the losses in this and other States caused by this fungus in certain years. It certainly exacts heavy toll upon the apple crop.

In some parts of New South Wales where apples are grown on a commercial scale, spraying for black spot is the exception, while in other localities growers cannot afford to take the risks involved by not spraying. Want of sufficient data upon which to base seasonal weather forecasts renders it impossible to tell if the season will be favourable to spot development or not. Orchardists in districts in which black spot makes its appearance know to their cost what effect it has upon the market value of their fruit. Fruit in which there is a moderate or large percentage of spotted fruit takes more time in handling than clean fruit, and there is, of course, a large percentage of waste.

Individual growers, who during a clean year have worked up a direct trade by consistently supplying clean fruit, have their trade injured or lost when the fruit is of poorer quality. The same state of affairs obtains when the fruit is packed and sold by a co-operative packing company. Buyers are compelled to be fastidious, and must consider their customers, and since they have a wide choice, and inferior fruit means dissatisfied and lost trade and reduced profits, they naturally pass by apples whose quality and appearance are not satisfactory.

Black spot will develop on fruit in storage, especially in common storage. In the case of protracted, showery, or rainy weather accompanied by fog or frequent recurrence of dew, the spot may not appear until the fruit is stored, the infection being so minute as to pass unnoticed. The spot will also attack the leaves and flower stalks. In the former case the attack may be so severe as to cause complete defoliation of the tree. In the latter case complete loss of crop on the tree affected may result. At times, spot interferes with proper development of the fruit and marked malformation is caused.

Briefly stated the symptoms of black spot are as follows:—It first appears on the leaf, giving an almost semi-transparent appearance when looked at from the upper surface, and the colour deepens with age to a greenish brown. The spots may be few and scattered, or so numerous that they coalesce. On the fruit the spots are usually darker than on the leaves. As the scab spot grows older, it undergoes marked changes. The central or older part becomes

bare, brown, and corky, while the margin is black. A more or less whitish band, due to a loosened cuticle, may surround the black band. Sometimes the scab spots may enlarge and cover large areas of the apple, and cracking of the fruit results. This is due to the inelasticity of the scabbed area, which is unable in any other way to respond to internal pressure. Scab spots resulting from late autumn infection differ in some respects from those developing earlier when the fruit is young. Often they will have changed considerably before the cuticle ruptures. They seldom reach the stage in which the centre becomes brown and bare. Black spot at times occurs on twigs, and the bark blisters.

It has been demonstrated by plant pathologists that *Venturia inæqualis* has two distinct stages in its life cycle. The perfect or perithecial stage of the fungus begins to develop in fall or early winter, and is carried over chiefly on the dead leaves of the preceding year. The perithecia, which are minute flask-shaped structures that form in the tissue of the leaves, contain the ascospores which mature in the spring and are discharged about the time the trees begin to function if the climatic conditions are favourable.

The spores do not all develop simultaneously, and under wet conditions an uninterrupted discharge of spores can be expected for some time. Climatic conditions vary considerably year by year. In districts which are very susceptible to black spot dry conditions may prevail during the whole of the growing season, and, consequently, there is no outbreak; or conditions conducive to black spot development may occur when the earlier blossoming varieties are in bloom and the infection may not last long. Sometimes during the blossoming period of all varieties of apples we get atmospheric conditions which favour spot-development, and all varieties may become infected. In some seasons there is no early outbreak, but during the latter part of the season wet weather may set in, and infection takes place. In yet other seasons conditions may favour the discharge of ascospores at about blossoming period and such conditions may continue periodically right up to the picking season. Hence we get a discharge of ascospores over the maximum period and a vegetative development of the fungus right up to harvest time. It is during a season like this that black spot is extremely difficult to control.

At times we get erratic results from spraying. This may be due to carelessness in mixing and applying, and to spraying in the heat of the day, which should be avoided. Burning of the foliage is sometimes noticeable, generally occurring when cool cloudy days are followed by hot days, the spraying being done during the heat of the day. Too much spray applied to a tree is also a factor, but taking everything into consideration, erratic results are generally due to the vagaries of the weather, or to the fact that spraying is done irregularly, or because the spray is applied too late, too early, or too irregularly.

Since it has been proved that the primary sources of infection are carried over on the leaves, it is at once evident that well directed efforts should be made to destroy the leaves. Theoretically the idea seems sound enough,

but the only practical method that can be employed is to plough the leaves under during the winter, and suspend cultural operations until after the time when the trees are most susceptible to attack.

In most of our districts which are very favourable to the development of spot, these steps can be carried on with safety, as there would be no danger during the interval of the trees being prejudicially affected, and no difficulty would be experienced in working up the land afterwards. This is being practised in many orchards in "spotty" localities. Keeping the soil chipped under the trees before they blossom will destroy any weeds growing there which tend to hold the fallen apple leaves and which retain moisture, thereby assisting in the discharge of ascospores.

Trees should be pruned in such a way as to lessen the thickness of the veil which would otherwise be presented to the suns' rays. Sunlight and free circulation of air are potent factors in hindering the development of black spot.

Good drainage also assists, for land which is supersaturated aids in spore-discharge and spot-development. In the same way orchards growing near neglected areas are seriously handicapped, even when the orchardist takes measures to combat black spot, his efforts being largely rendered nugatory by the proximity of fresh sources of infection. Location is very important. Trees grown in certain parts of certain localities are not affected, while trees in places close by suffer. In selecting an orchard site good land and air drainage are of great importance. Where trees are planted in pockets into which air currents commonly do not pass the trees are more susceptible to attack.

The most important method of controlling spot is spraying. Clean fruit cannot be grown in some localities unless the trees are sprayed, and growers should realise that to get the best results spraying should be anticipatory; they should not wait until the disease has made its appearance before they take action. An efficient outfit that is capable of doing the work within an effective period of time is essential to success. Before the season commences the pump should be overhauled and any necessary adjustments made; hoses should be tested and everything got ready, and spray material should be on hand. In mixing sprays care should be taken to see that the right material and quantities are used, and that they are mixed in a proper manner; guess-work and carelessness should be avoided. When spraying, keen supervision over the orchard hands is necessary, as to be effective spraying must be thoroughly done. At the same time much spray is wasted and the trees often injured by too heavy applications. Many growers make the great mistake of delaying spraying if rainy weather happens to be threatening at the time, thinking that the rain will wash off the spray. As a matter of fact it is during wet weather that the spray is needed to protect the trees from infection, which occurs only in the presence of excessive moisture; if it has about twenty minutes to dry before the rain occurs it will adhere well. Any spray that will not stand some rain after it has once dried on a tree cannot be considered an efficient preventive of this disease.

Many growers who have been using lime-sulphur over a long period have obtained good results. As regards Bordeaux mixture, there is no doubt as to its efficiency in controlling spot, and it certainly proved more efficacious than lime-sulphur, but on the other hand, if used after bud-greening it has a tendency to russet the fruit. In some seasons the russet may be slight, in other years heavy and barklike, causing considerable cracking of the fruit and greatly reducing the commercial value of the apples. The russeting of the fruit is accentuated when foggy weather is experienced after the application of spray.

A programme which has given good results in tests carried out by this Department, and which is being adopted by many of our growers, is Bordeaux mixture at bud-greening followed by an application of lime-sulphur at pinking and calyx stages, and later applications with lime-sulphur should atmospheric conditions prove conducive to spot development.

Lime-sulphur at spur-bursting stage, followed by lime-sulphur, has also given good results, and the same applies to Bordeaux mixture following Bordeaux mixture, only in this case a considerable amount of russeting may take place To know when infection occurs is to know when to spray.

The first infection usually takes place when the blossoms are about to open or soon after, and it is at that time, that is, in the spring, that we frequently get weather conditions favourable to the discharge of the ascospores and development of the fungus. Of such conditions spraying should be anticipatory so as to insure the trees against early infection. Hence it is recommended that an application of Bordeaux mixture or lime-sulphur be applied at spur-bursting stage and this should be followed by an application of lime-sulphur at pinking. An application of lime-sulphur after the blossoms fall is necessary in order to protect the trees from later attacks, and should climatic conditions be favourable to black spot development the trees should be sprayed again. By that time the apples will have grown considerably and new surfaces will be exposed.

New Fruit Preserving Method.

A Method of preserving fruit so that it will withstand a journey of several weeks in the hold of a ship without refrigeration is said to have been discovered by a London chemist. The method consists of dipping or spraying the freshly picked fruit with a chemical solution; the fruit is then drained and dried, when an invisible coating forms round it which prevents transpiration and keeps it in a perfectly natural condition even at semi-tropical temperatures.

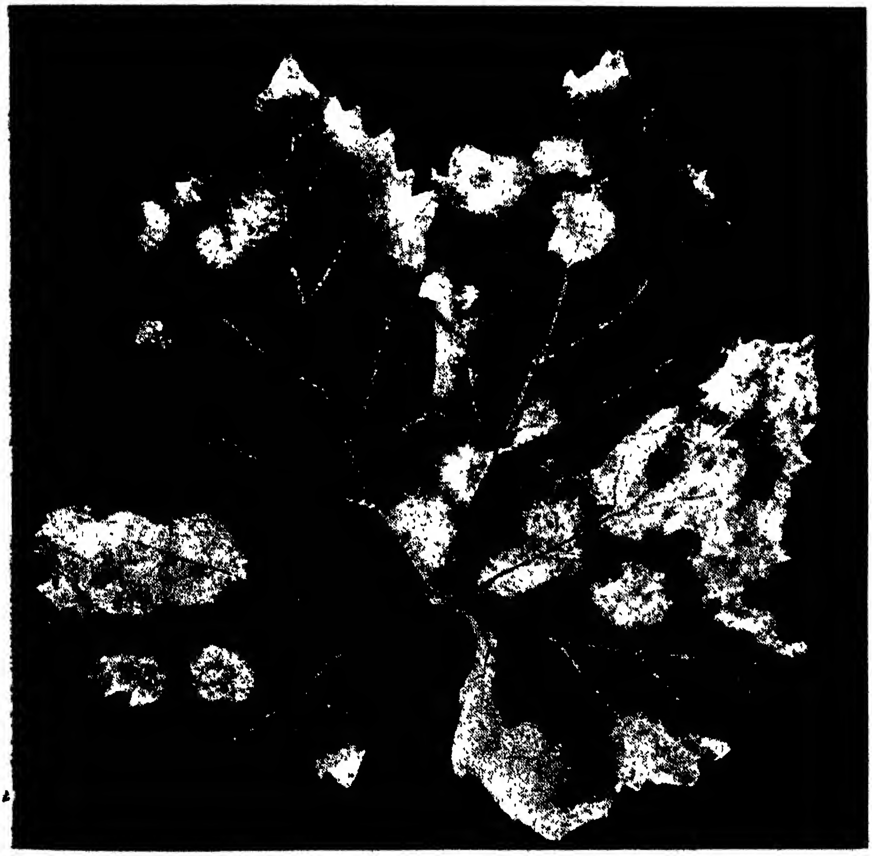
The full bouquet and flavour, as well as the colouring, are, it is claimed, preserved in their entirety, and the fruit can be eaten just as it arrives from shipment. The cost of the preparation is negligible.

Inquiries concerning the above process are being made by the Federal Department of Markets and Migration.

Downy Mildew of the Grape.

H. L. MANUEL, Viticultural Expert.

Since the first outbreak of downy mildew in Australia, so much has been written and said regarding the disease and its treatment, that readers will perhaps consider they have had a surfeit on the subject. However, after witnessing the results of last season's vintage (chiefly due to the ravages of the disease) and the failure of many growers to realise the gravity of the menace (as shown by their neglect to spray consistently) it appears necessary to again broach the subject with a view to once more driving home the necessity for spraying, and at the same time to point out the advisability of including the operation of spraying in the general routine of vineyard work.



Early Stages of Downy Mildew on under-surface of the leaf of Vine.

The weather conditions experienced last season were ideal for downy mildew development, and it was very noticeable that where spraying had been neglected crops were very poor and very little was vintaged from such patches. In the Hunter River district the necessity for spraying was particularly evident, and I would say that in this district the vintage was 70 per cent. short of expectations early in the season—mainly the effect of the disease. Growers who sprayed as they should have done had a fair vintage. On the other hand, those who did not spray vintaged practically no crop at all, and what was picked was inferior stuff and consequently yielded poor quality wine. The same applies more or less to other parts of the State.

It would probably be right to say that owing to the ravages of downy mildew —or to be more correct, owing to the neglect of many growers to spray consistently—the vintage figures for the State were reduced by 40 per cent.

It must be realised that not only is the crop at stake by not spraying, but that what may be harvested from a badly affected vineyard will make a poor quality wine. The worst feature with wine made from grapes badly affected with mildew is that it causes the cellarman a great deal of trouble and anxiety in handling, and one cannot blame buyers who refuse to purchase either grapes affected with the disease or wine made from such grapes.

It is quite probable that the State, after experiencing a wet winter, may see a dry summer, and in that case there will be little or no trouble from this disease, but in dealing with downy mildew preventive measures at all times should be resorted to, and hence the advisability of spraying as an insurance —at all events in the early part of the season. Further spraying can be undertaken later as appears necessary.

Free leaflets and further information on the subject can be obtained on application to the Department.

"Systematic Pomology."

The need for a text-book, classifying, arranging, and fully describing pomological material was impressed upon the author of this book, Professor U. P. Hedrick, years ago, but a first attempt fell short of the ideal, and it is only now, with a good deal of material compiled for other purposes, that the original objective has been attained. "Systematic pomology is the study of the kinds of fruits and their relationships," we are told, the structure and arrangements of the various organs being examined to determine wherein they differ from, and wherein they resemble one another. Such a classification, of course, is but a means to an end, and must always be arrived at with the reservation that further knowledge may necessitate alteration.

The book opens with some account of the parts of the higher plants—root, stem, leaf, flower, fruit—devoting a chapter to each, and it then takes up successively the pome fruits, drupe fruits, grapes, brambles, currants, heath fruits, and so forth.

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Poultry Notes.

October.

JAMES HADLINGTON, Poultry Expert.

The hatching season is now over, but there are yet a few weeks of strenuous work before the brooders are clear of chickens. Up to quite recent years it has been necessary to warn poultry-farmers against late hatching. A change has, however, come over the poultry industry, and as far as the great bulk of commercial poultry farms are concerned the lesson has been learnt, and there is less necessity to urge the closing of the hatching season with September than was formerly the case. Perhaps the facility with which day-old chickens can now be procured has contributed to this result. In this connection, however, there is a disposition on the part of farmers to run to extremes, inasmuch as where partial failure in hatchings has occurred there is a growing tendency to rush for big batches of day-old chickens to make up the deficiency at the end of the season. This may be good business for the hatcheries, but it does not follow that it is equally good for the farmer.

The trade in day-old chickens mostly means quantity, with very little quality. There are, of course, exceptions, but the solid interests of the poultry industry are dependent upon stock of higher quality than for the most part is obtainable in this way. The advent of mammoth incubators, together with the exorbitant prices charged for small incubators, and the desire to reduce labour on the farms, is inducing hundreds of poultry-farmers to rely upon day-old chickens and to abandon hatching themselves. In this we are following along the lines of a well-known district in America, which is renowned for the low average production of its hens, and where nearly double the number of hens must be kept to return a living to the farmers. Whether this is progress or retrogression may be left to our poultry-farmers to decide. In the meantime one is impelled to point out that more careful breeding is necessary to retain the high average production attained in Australia.

Export and Cold Storage.

At the present time fully one-third of the eggs produced on commercial farms are being either exported or cold stored. If this were not so, instead of 1s. 4d. per dozen, eggs would in all probability be down to 1s. or even less. What this would mean to the farmer with the present high cost of feeding can be left to him to figure out. Most poultry-farmers appreciate the position in this respect, and take every precaution to see that the eggs that leave their farms are what they should be in respect of being fresh, clean, and properly graded and packed. Unfortunately, however, there are others who are not

so scrupulous about any of these things. Such consignors, by their carelessness in these matters, largely increase the cost of repacking and grading, for eternal vigilance is necessary on the part of the packers to eliminate stale and small eggs. A still worse feature is the inclusion of infertile eggs that have been under incubation.

In pre-export days, and when cold storage was practised principally on account of pastrycooks and similar users of eggs, these practices, while reprehensible, were less serious than is the case under present conditions. The greater part of the repacking, both for cold storage and for export, is done under " pool " auspices, where the farmer pays dearly, although he may not know it, for all the extra care and vigilance that has to be exercised to eliminate such eggs, and must eventually stand any loss accruing from these causes Even if from no other motive, the " poolite " especially should recognise that part of his penny levy is swallowed up in losses sustained in this way.

It cannot be too strongly emphasised that poultry-farming has entered upon a phase similar to that of the dairy industry, when quality must be the first consideration. In this connection, to insure economical repacking, grading, &c., it is most essential that eggs be properly handled on the farm, gathered twice a day, marketed twice per week, and graded into three sizes. First-grade eggs should weigh from 1 ¾ oz. upwards, the whole to average not less than 2 oz.; second-grade should weigh 1½ to 1¾ oz.; and all below these weights should be classed as pullets' eggs. In addition to this classification any doubtful eggs should be labelled " case eggs," while eggs that have been dirty, necessitating their being washed, should be labelled " washed eggs." These latter if sent right into consumption are quite good, but washed eggs lose their keeping qualities, owing to the removal of their natural protective coating; hence they will not keep so long as unwashed eggs, and are unfit for storing or for export.

The observance of these simple rules would lighten the supervision over the packers, and enable the latter to handle very many more eggs. All such saving of labour is equal to a rise in price to that extent, and quality could be guaranteed, leading to greater confidence on the part of consumers and inducing an increased demand for eggs. If only from motives of self-interest, greater care should be exercised in these matters.

Weighing Eggs.

In connection with grading to weights, it may seem to many somewhat arbitrary that the weights quoted should be observed, but in reality the grading is very simple. Any person who has packed eggs, even for a few days, should be able very closely to gauge the size of eggs, sufficiently at any rate to reject those below grade in each case. Some people will, of course, pick up the idea of size much more readily than others, but in any case the quickest way to learn to do this is to have a pair of small scales at one's hand

set to 1¾ oz., so that doubtful ones can be tested, not alone with a view to keeping undersized eggs out of that particular box, but in order to teach the packer to judge size. Such scales are now on sale at about 7s. 6d. per set.

From another point of view good grading is profitable and scales will pay for themselves many times over. One often sees in badly graded consignments even 2-ounce eggs put into the second-grade, whereas they should, of course, be in the first. When it is considered that the difference between first and second grade is often 4d. per dozen, it will be obvious that quite a considerable loss can occur to the farmer from inefficient grading. The writer is often witness to losses sustained in this way, even by farmers who pride themselves upon their good grading. The fact is that scales are necessary to check one's judgment on size from time to time.

Export of Griller Chickens.

With the approach of the season when a considerable glut of this class of table poultry is looked forward to, especially this season, there is a revival of interest in the matter of export. In this connection a demonstration was arranged recently at the Government Poultry Farm, Seven Hills, when the matter was gone into, the outcome being that a small committee was formed to further the objective, and the opinion was freely expressed that it would be possible to make a shipment of some 4,000 to 6,000 grillers on behalf of poultry-farmers to be sent on consignment to London. The Coastal Farmers' Co-operative Society have offered the use of their depot at Parramatta for dressing and packing, and if desired will finance the dressing, packing, and expenses on the consignment to London This gets over one of the difficulties that was seen to be in the way of such an effort.

Preparation of the Chickens.

In poultry notes for February and June last, information was given regarding the age, weight, and treatment of the small trial consignment of 600 birds that was sent to test the London market by the Department last January, but questions asked at the demonstration mentioned above show that further information is desired on some points.

The chickens for export should be between 10 and 13 weeks old, and weigh 2¼ to 2½ lb., live weight, prior to the thirty-six hours fasting which is necessary before killing. Experience shows that such chickens will lose in weight during the fasting, and this, together with the loss of feathers in plucking, approximates 7 ounces. This is the only loss in weight, since they are not drawn for export. Only good, plump chickens should be sent.

With regard to the consignment sent by the Department last January, the only special treatment given them either in feed or attention was that during the last two weeks they were fed entirely on wet mash mixed with skim milk, and, of course, as much as they would eat of it. Very little green feed was fed during this time, and none during the last few days. This is

important. They were kept in small yards in batches of forty to fifty, the size of the yards being 30 feet by 8 feet. In this connection it is not desirable that the chickens be run on larger range. As a matter of fact, in the case of chickens that have been on wider range it will be best to restrict their run during the last two or three weeks, as they put on more flesh if not allowed too much range.

White Leghorns suit this trade admirably, and are preferred to the black breeds. Care should be taken, however, to reject any that are pronouncedly yellow in skin. The report on last year's consigmnent states that "white-fleshed, milk-fed birds are what London wants." When forwarding these chickens alive to the dressing station care should be taken not to put too many in one crate, or they will get overheated or sweated. About ten to twelve pairs in an ordinary Government crate is ample.

"A Class Book of Botany."

The course of study presented in this handbook of 514 pages was prepared for students for university matriculation and other examinations of the same standard, but it should also be of use to many whose knowledge of the subject is perhaps less systematic and yet fairly good. In accordance with modern ideas about the teaching of elementary botany, the book is more concerned with the life histories, activities, and general behaviour of plants, rather than with their structure. In fact, as the author points out, details of structure are introduced only so far as they are necessary for the understanding of the vital processes of the plants. The earlier chapters deal with the conditions of healthy existence of individual plants, and this leads to a description (fuller than is usual in books of this character) of many varieties that are quite easily accessible. Chapters on reproduction and classification afford opportunity for the study of a number of common families of flowering plants.

The author, Mr. E. Stenhouse, is a teacher and examiner of long experience, and his method of presentation is therefore a sound one, and aims at a close association of description and observation and experiment. The bearing of botany on practical agriculture and horticulture has also been kept in mind, though the plants actually studied are, as might be expected, mostly British. Our copy from the publishers, Macmillan & Co., Ltd., London.

Bovine Tuberculosis.

It is safe to say that were bovine tuberculosis a disease of more spectacular symptoms, like foot and mouth disease, and were its onset more rapid and its losses more quickly evident, measures against it would long ago have been more drastic, and the country would at the present time have made better progress towards that desirable achievement, eradication.—Professor S. H. Gaiger, in the Scottish *Journal of Agriculture.*

Pure Seed.

Growers Recommended by the Department.

The Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops, in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon, and (2) after a sample of the seed has been received by the Under Secretary and Director, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the prices for the seeds mentioned hereunder.

Maize:—	
Fitzroy	R. W. Hindmarsh, "Wiaraga," Bellingen.
	Manager, Experiment Farm, Grafton.
Ulmarra Whitecap	R. W. Hindmarsh, "Wiaraga," Bellingen.
Leaming	Manager, Experiment Farm, Grafton.
Golden Glow	J. F. Chick, Hill View, Tenterfield.
Fitzroy	F. W. Hill, Willowvale, Yarramalong.
Iowa Silvermine	R. Clifton, Farm 1,878, Griffith.
	H. Mallaby, Farm 1,864, Griffith.
Sweet Sorghums:—	
Collier	Manager, Experiment Farm, Grafton.
Early Amber Cane	Manager, Experiment Farm, Bathurst.
Honey	Under-Secretary, Dept. of Agriculture, Sydney.
Saccaline	Manager, Experiment Farm, Lismore.
Selection, No. 34	Manager, Experiment Farm, Yanco.
Selection, No 61	Manager, Experiment Farm, Grafton.
Grain Sorghums:—	
Milo	Manager, Experiment Farm, Cowra.
Feterita	Manager, Experiment Farm, Coonamble.
Manchu Kaoliang	Manager, Experiment Farm, Bathurst.
Dual-purpose Sorghum:—	
Darso	Manager, Experiment Farm, Glen Innes.
Potatoes:—	
Carman No. 1	Moreton McDonald, Crookwell.
Early Manhattan	K. Bowen, Springside, via Orange.
Surprise	Moreton McDonald, Crookwell.
Grasses:—	
Phalaris bulbosa	Col. H. F. White, "Baldblair," Guyra.
Hooker's Fescue	Manager, Experiment Farm, Glen Innes.
Sudan Grass—	
Sudan Grass	Manager, Experiment Farm, Cowra.
	Manager, Experiment Farm, Temora.
	Manager, Experiment Farm, Nyngan.
	H. K. Nock, Nelungaloo.
	R. Wilson, North Logan, Billimari.

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

Orchard Notes.

October.

W. J. ALLEN and H. BROADFOOT.

There is every indication of a prolific fruit crop during the coming season, and attention should be paid to effective cultivation, especially in the drier districts, as such cultivation assists in the conservation of moisture, stimulates growth, and assists the tree to carry its load. Plant foods in solution are absorbed by the roots, and if moisture is not conserved, and the seasons are dry, the trees and their crop will be prejudicially affected.

The aim of the grower should always be to produce good fruit. There are influences beyond his control which have a detrimental effect upon quality and quantity; but, on the other hand, there are factors within his control which will, if neglected, exact heavy toll. Conservation of moisture is, generally speaking, one of these.

Trees planted as refills should receive all due attention. The land should be well worked, and, if necessary, the young trees should be watered. Refills suffer from extraction of moisture by adjacent older trees, and this must be neutralised as suggested. The foregoing applies to newly-planted citrus trees, as well as to deciduous trees planted last winter

Spraying.

This is a busy month for the apple and pear grower. In some of the earlier districts the earlier varieties of apples and pears have received their first application of lead arsenate, but the great majority of these fruits will not be ready until this month. Spraying for codlin moth requires the close attention of all growers of pome fruits—apples, pears, quinces—and to be effective the work must be thoroughly done. The calyx spray is an important one, and force is required to drive it into the calyx. It must be done, of course, before the calyx closes. Some growers do not approve of long-distance nozzles, such as the gun or pistol type, for calyx sprays, but prefer angle nozzles, though strong advocates of long distance nozzles for other work.

A close watch should be kept on those trees the fruits of which are known as drupes—peach, nectarine, plum, cherry—for the appearance of aphis. When these are observed, the trees should immediately be sprayed with tobacco wash, or with one of the approved nicotine extracts. Force is required to break up the aphis clusters. The spraying should be repeated in a day or two, if live aphis are still present.

Strict lookout should be kept for the apple leaf jassid. This pest appeared in many of our apple districts last year in large numbers, and did considerable damage to the foliage by sucking the sap, causing the leaves to shrivel, and, in many cases, discolouring the fruit by exudations and excrement. Thoroughly clean cultivation is necessary in fighting this pest, and applications of a nicotine wash will be specially effective in the younger or larval stages of the development of the insect referred to.

In localities where apples and pears are susceptible to an attack by black spot, growers are advised not to run the risk of neglecting early applications of spray, nor to omit the later applications if climatic conditions prove favourable to spread of the disease. Meteorologists have not yet the necessary data to enable them to forecast seasonal conditions, but growers should not run unnecessary risks. Spraying for this fungus in susceptible localities should be anticipatory. Detailed reference to black spot fungus is not necessary here, as the matter is dealt with in a separate article in this issue.

Disbudding.

Tops which have been grafted or cut back to buds inserted during the previous summer should be examined periodically, to see that their growth is not retarded by shoots from the stock.

When old trees have been re-worked, it is advantageous not to rub all the shoots growing from the stock, but leave some of the weaker ones, merely pinching them back, so that they will afford shade for the stock until the head of the tree is formed. When scions of grafted trees have failed, leave a sufficient number of strong shoots from the stock to be budded later in the season.

Keep up the Quality.

Some of the citrus fruits forwarded to certain citrus packing sheds is very inferior, and suggests the idea that there are growers who imagine that a co-operative packing shed is a clearing house for any rubbish that they may choose to deliver. The manager should have courage enough to refuse to handle any stuff below a certain grade, and in taking such a stand he should be assured of the support of the great majority of growers, whose interests are best served by securing and maintaining the confidence of buyers. If that confidence is lost, and buyers once feel that the reputation of a packing shed is not synonymous with good quality and properly graded fruit, the first to suffer will be the suppliers. A manager who studies the reputation of his packing shed should be supported by all reputable growers, and their support should, in their own interests, be of no half-hearted character. Suppliers must of course do their part also by supplying fruit of good quality. Most growers know what steps must be taken to secure such a desirable result. Prudent choice of varieties of trees, good cultivation, adequate and judicious manuring, and spraying and careful handling—upon these points it is not necessary to enlarge.

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture Sydney, not later than the 18th of the month previous to issue. Alterations of dates should be notified at once.

1925

Society.	Secretary.	Date.
Narrandera P and A. Association	W. H. Canton	Oct. 13, 14
Ariah Park A. Society	J. F. McInnes	,, 14
Carcoar H. C. and A. Society	T. J. Brady	,, 14
Millthorpe A. and P. Association	T. P. Smith	,, 20, 21
Deniliquin P. and A. Society	P. Fagan	,, 21
Central Richmond River A. Society (Coraki)	J. Allison	Nov. 4, 5
Nimbin A. and I. Society	G. R. Southwell	,, 11, 12
Lismore A. and I. Society	H. Pritchard	,, 17, 18, 19
Tweed River A. Society (Murwillumbah)	T. M. Kennedy	,, 5, 26
Orara River A. and H. Society (Coramba)	H. E. Hindmarsh	,, 25, 26
Quaker's Hill Agricultural Bureau	H. Trezise	Dec. 12

1926.

Society.	Secretary.	Date.
Albion Park A. and H. Association	H. R. Hobart	Jan. 1, 2
Dapto A. and H. Society	E. G. Coghlan	,, 15, 16
Kiama A. Society	G. A Somerville	,, 26, 27
Wollongong A. H. and I. Association	W J. Cochrane	,, 28 29, 30
Mullumbimby A. Society	A. V. E. Overall	Feb. 10, 11
Pambula A. H. and P. Society	L. K. Longhurst	,, 17, 18
Newcastle A. H and I. Association	E. J. Dann	,, 23 to 27
Alstonville A Society	W. J. Dunnett	,, 24, 25
Gunning P. A. and I. Association	G. E. Ardill	,, 25, 26
Tingha	A J. Dunshea	,, 26, 27
Blacktown A. Society	J. McMurtrie	,, 26, 27
Tumut A. and P. Association	T. E. Wilkinson	Mar. 2, 3
Gloucester A. H. and P. Association	H. Watson	,, 2, 3
Bangalow A. and H. Association	....	,, 3, 4
Hunter River A. and H. Association (West Maitland)	M. A. Brown	,, 3, 4, 5, 6
Berrima A. H. and I. Society (Moss Vale)	W. Holt	,, 4 5, 6
Nepean A. H. and I. Society (Penrith)	C. H. Fulton	,, 5, 6
Mudgee A P. H. and I. Association	J. H. Shaw	,, 9, 10, 11
Yass P. and A. Association	E. A. Hickey	,, 10, 11
Ulmarra P. and A. Society	....	,, 10, 11
Cobargo A. P. and H. Society	T. Kennelly	,, 10, 11
Manning River A. and H. Association (Taree)	R. Plummer	,, 10, 11, 12
Cessnock A. Association	Bill Brown	,, 11, 12, 13
Campbelltown A. Society	W. N. Rudd	,, 12, 13
Cumnock P. A. and H. Association	K. J. Abernethy	,, 17
Gundagai P. and A. Society	M. W. Holman	,, 17, 18
Rydal A. H and P. Society	V. Bruce Prior	,, 19, 20
Royal Agricultural Society	G. C. Somerville	,, 29 to Ap.7
Clarence P. and A. Society (Grafton)	L C. Lawson	April 21 to 24
Lower Clarence A. Society (Maclean)	T. B. Notley	,, 28, 29
Richmond River A. H. and P. Society (Casino)	....	May 5, 6, 7
Kyogle P. A. and H. Society	L. Campbell	,, 12, 13
Bonalbo A. and I. Society	W. G. E. Johnston	,, 27, 28
Murrumbidgee P. and A. Association	F. H. Croaker	Aug. *24, 25, 26

Vol. XXXVI. Part 11. NOVEMBER 1, 1925.

Agricultural Gazette of New South Wales.

Field Experiments with Wheat.

Cowra Experiment Farm.

Variety Trials over a Three-year Period.

N. S. SHIRLOW, B.Sc. (Agr.), Experimentalist.

These trials have been continued with the object of testing varieties (both local crossbreds and introduced sorts) as to their suitability for the district for grain and hay where possible. Yields of each variety for the years 1922, 1923, and 1924 are shown in the following summary:—

Two sowings were made in both the grain and hay section each year. The early planting took place in 1922 on 12th April, and in 1923 and 1924 during the first week in May. The late planting took place at the end of May in each of the three seasons.

The varieties in each planting were sown in triplicate and the figures below are the result of averaging the yields from each of three plots, one-thirtieth of an acre in area. The usual experimental precautions were observed regarding treatment of soil, methods of harvesting, weighing, &c., to ensure uniform conditions for all varieties.

A summary of these trials for the years 1911 to 1921 (*Agricultural Gazette*, Vol. XXXIII, page 837), gives details of soil and climate conditions, methods of farming, &c., in the Cowra district, and might well be perused in conjunction with this report.

Early Sown Grain Trials (seed 42 lb., and superphosphate 60 lb. per acre).

Variety.	1922. Per acre.		1923. Per acre.		1924. Per acre.		Average over three years. Per acre.	
	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.
Bena	33	12	61	15	46	5	46	50
Wandilla	36	43	49	7	45	33	43	47
Booral	......		......		43	11	43	11
Canimbla	29	39	44	9	54	58	42	55
Cadia	31	12	39	16	53	53	41	27
Baldry	33	6	43	33	43	26	40	2
Onas	31	30	41	37	45	45	39	37
Gresley	......		36	50	......		36	50
Hard Federation...	23	0	42	50	41	18	35	43
Bandon	23	29	30	29	44	21	32	46

LATE Sown Grain Trials (seed 52 lb., and superphosphate 60 lb. per acre).

Variety.	1922. Per acre.		1923. Per acre.		1924. Per acre.		Average over three years. Per acre.	
	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.
Waratah	34	3	47	20	51	6	44	10
Boonoo	......		47	14	39	57	43	35
Bena	31	50	50	30	46	26	42	55
Duri	......		46	26	39	29	42	50
Hard Federation	31	30	47	20	40	36	39	48
Bobin	......		44	18	34	45	39	31
Wilfred	29	20	49	27	......		39	23
Baldry	32	59	43	53	40	36	39	9
Newman's Early	33	51	42	55	36	47	37	51
Bandon	33	4	39	48	39	50	37	46
Gresley	23	32	41	10	......		32	21

EARLY Sown Hay Trials (seed 42 lb., and superphosphate 60 lb. per acre).

Variety.	1922. Per acre.			1923. Per acre.			1924. Per acre.			Average over three years. Per acre.		
	tons	cwt.	qrs.	tons	cwt.	qrs.	tons	cwt.	qrs.	tons	cwt.	qrs.
Waratah	......			5	2	2	4	15	0	4	18	3
Canimbla	3	10	1	5	11	0	4	13	0	4	11	1
Warden	3	7	1	5	10	0	......			4	8	2
Yandilla King	......			......			4	4	0	4	4	0
Wandilla	3	15	1	4	11	1	4	5	0	4	3	3
Barwang	2	14	0	4	11	2	3	19	3	3	15	0
Baldry	3	8	2	......			......			3	8	2

LATE Sown Hay Trials (seed 52 lb., and superphosphate, 60 lb. per acre).

Variety.	1922. Per acre.			1923. Per acre.			1924 Per acre.			Average over three years. Per acre.		
	tons	cwt.	qrs	tons	cwt.	qrs.	tons	cwt.	qrs.	tons	cwt.	qrs.
Barwang	2	13	2	3	17	3	3	16	0	3	9	0
Waratah	2	9	3	3	15	0	3	19	1	3	8	0
Clarendon	2	11	2	3	12	1	3	13	3	3	6	2
Firbank	2	7	3	2	9	3	3	9	2	2	16	1
Gresley	1	5	2	2	19	3	3	9	3	2	11	2

Working of Fallows and Preparation of Seed-bed.

For 1922 crop, ploughing started on 16th August, 1921, with mouldboard plough; in addition the land received three skim ploughings, three cultivations with springtooth cultivator and was harrowed twice. For the late sowing an additional cultivation and harrowing was given.

For 1923, mouldboard ploughed in July, 1922; skim ploughed December, 1922; springtooth cultivated seven times, and harrowed twice, with an additional cultivation and harrowing for the late sown section.

For 1924, mouldboard ploughed in July, 1923; skim ploughed February, 1924; three springtooth cultivations and two harrowings; one extra cultivation and harrowing for the late sowing.

For 1922 and 1923, the seed was pickled with bluestone, but in 1924 dry copper carbonate used. The plots were free from bunt in the three seasons.

The Seasons and Growth of Plots.

In 1922, 2,015 points of rain fell, being distributed as follows:—

	Points		Points
January	189	July	287
February	196	August	141
March	18	September	125
April	216	October	140
May	173	November	0
June	111	December	420

The growth was good during the early portion of the season, but was retarded through lack of rain in June. Good rain in July gave a fresh impetus to growth which continued evenly till harvest. Dry weather in November was responsible for an early ripening and slight pinching of the grain in some varieties. The hay was a good sample owing to ideal haymaking weather conditions. The hay trials were harvested the second week in October, and the grain was stripped the last week in November.

In 1923, 2,131 points fell, distributed as follows:—

	Points.		Points.
January	70	July	277
February	0	August	136
March	20	September	406
April	0	October	265
May	100	November	194
June	525	December	138

The growth was slow at first, as there was very little rain till June. Rapid growth followed and was carried on by good rains in September and October. A good sample of hay was made and in the grain trials the heads were well filled. The apparent yield was very deceptive, some plots appearing thin, but giving a yield of over 40 bushels per acre, the heads being exceptionally well filled. The hay trials were cut late in November and the grain trials were stripped first week in December.

In 1924, 2,716 points of rain fell, distributed as follows:—

	Points.		Points.
January	129	July	177
February	239	August	213
March	15	September	546
April	206	October	224
May	114	November	565
June	193	December	95

The plots germinated well and came on very quickly, the early sown sections growing to a height of 5 feet. Heavy rain in November spoilt the sample of hay, but very few plots lodged. Bobin and Newman's Early were the only

varieties damaged, but not to such an extent that they could not be harvested. Rust was prevalent mainly on the flag, the later sown varieties being attacked more than the early. The hay trials were harvested early in November, and the grain trials the second week in December.

The tables of yields for the three seasons show increases in 1923 and 1924, where good rains fell during the critical period. In 1922 the rainfall was only 116 points short of 1923, but it was not distributed as satisfactorily for the crop.

Some of the Varieties.

Waratah (Purple Straw x Gluyas).—Did well in both hay and grain trials, especially in 1924, when it grew to a height of 5 feet and did not lodge in spite of rough weather in November.

Bena (Fr. Hard Federation x Marshall's No. 3).—Yielded well in early and late sowings in all seasons; no lodging took place, and the heads were large and well filled.

Cadia and *Canimbla.*—Both are late-maturing varieties; they yielded well in the wet years, but proved slightly too long seasoned for this district with its usual rainfall.

Wandilla (Fr. Federation x Yandilla King).—Yielded well, especially in 1922; a few days later than Hard Federation.

Hard Federation.—This is the standard variety, used as a check in both grain trials. It grows slightly taller than Federation and ripens a week earlier; holds its grain well, and does not bleach as easily.

Experiments in the Renovation of Paspalum.

Last season experiments were commenced at this farm with a view to ascertaining the best treatment to adopt in the renovation of paspalum pastures on the basalt soils of the Northern Rivers. A number of fertilisers (single and in combination) were tried as top-dressing, the treatment in each case being preceded by a thorough scarifying with an implement locally designed for that purpose. The results for last season were interfered with by continuous rains in the late summer, which prevented comparable results being obtained on the various plots. It was quite obvious, however, that greatly increased growth was obtained on some of the plots, notably those treated with basic superphosphate at the rate of 2 cwt. per acre, and superphosphate at 2 cwt. per acre.

Experiments of this kind have been conducted in previous years, but this is the first occasion on which top-dressing has been accompanied by the thorough scarifying referred to above. It is thought that the effect of the scarifying has been to enable the more thorough penetration of the fertiliser to the roots of the paspalum, while at the same time preventing washing of the fertiliser to the lower levels of the slopes found in this type of country. The tests are being continued and extended this season, and the results will no doubt be awaited with interest.—R. G. Downing, Senior Experimentalist.

Farmers' Experiment Plots.

POTATO TRIALS, 1924 AND 1925.

Central Western District.

W. D. KERLE, H.D.A., Senior Agricultural Instructor.

FIELD experiments were conducted by the following farmers in co-operation with the Department of Agriculture during the seasons 1924 and 1925 :—

Wm. Burns, "Goongirwarrie," Carcoar.
G. W. Kelly, Caves-road, Oberon.
F. Goodacre, Neville, Blayney.
J. C. Ironmonger, Huntley, Spring Hill.
E. A. de Latour, Springside, Orange.
B. C. Meek, Hobby's Yards, Newbridge.
J. M. Caldwell, "Paisley," Borenore.

Although good crops were obtained throughout the potato districts in the 1924 season the price was very low. Digging was delayed in hopes of a rise in price, but as this did not materialise, the tubers were not dug in many cases until they began to shoot—as late as November in the Oberon experiments. Publication of the results of experiments was withheld for inclusion with 1925 experiments at a more seasonable time of the year.

The Seasons.

While the 1924 season was favourable for the production of good crops the season just past was far from satisfactory. In both, the summer rainfall was above the average, with a sudden falling off in March, 1924, and in April, 1925. Cold temperatures and frosts as early as February were mainly responsible for low yields last season, coupled with the soil becoming badly set owing to heavy rains in summer and lack of rain at the end of March and during April. In both seasons the crops were free from disease with the exception of scab, which although not pronounced was most prevalent in the latter season. Potato moth was present in each year, but considerably more so in the 1924 crops, owing probably to the heavier crops and the dry early autumn. Rutherglen bug did considerable damage to early crops in that year also, but was absent this season. The rainfall registrations are attached.

RAINFALL for Seasons 1924 and 1925

Locality.	November.		December.		January.		February.		March.		April.		May		Totals.	
	1923.	1924.	1923.	1924.	1924.	1925	1924	1925	1924	1925.	1924.	1925.	1924	1925.	1924	1925.
Carcoar ...	49	330	143	71	83	283	258	109	30	154	278	82	Nil	221	8·41	12·56
Oberon ...	...	...	75	...	399	276	550	177	50	193	185	85	154	329	13·98	10·60
Neville ...	51	404	152	99	184	310	291	146	45	172	208	95	24	205	10·45	15·21
Springside ...	...	...	120	127	56	310	340	190	72	161	184	90	134	221	9·12	10·99
Huntley ...	...	..	..	101	...	257	...	131	...	186	...	91	...	247	...	10·13
Borenore ...	...	591	...	128	..	324	...	193	...	155	..	45	...	152	..	15·88
Hobby's Yards	32	..	127	...	133	...	424	...	58	..	188	...	.	..	9·62	...

Details of Experiments.

Carcoar.—Soil, grey granite loam, typical of the locality. Experiments sown on 14th November, 1923, on ground which had been under lucerne for four years. Superphosphate at 180 lb. per acre was sown in variety trials, and 8½ cwt. seed. Growth of tops satisfactory, but seriously damaged by Rutherglen bug in December and by caterpillars of gross web moth in March. Spraying with arsenate of lead in mid-March saved this crop from destruction by these caterpillars. The season favoured the late maturing varieties, and the pests were responsible for low yields of early varieties. Last season's trials were sown on 11th November, following winter fodders. Superphosphate applied at 2 cwt. per acre. Ground ploughed mid-October and springtoothed twice; in excellent condition at sowing time. Heavy rain and cold summer temperatures with frosts in February and April were responsible for comparatively low yields.

For the two seasons, Symington has given the best average yield, closely followed by Factor and Langworthy. Of the newer varieties, Elliott's Pink Eye shows considerable promise of being a good commercial variety.

Oberon.—Variety and manurial trials sown after peas in a definite two-course rotation on medium quality grey loam soil.

The 1924 experiments were sown on 21st December, 1923, in 3-feet rows, with 2½ cwt. superphosphate on the variety trial. The tubers were not harvested until November owing to the low prices ruling throughout the winter months. Some damage was done by Rutherglen bug in early varieties in January, and by potato moths in autumn.

The heavy rains in November and December delayed sowing of 1925 crop until 3rd January, 1925. On 22nd and 23rd February heavy frosts practically cut the crop to the ground, which, with low summer temperatures reduced the yields to considerably below normal.

The manurial trials, sown with Early Rose, have been in favour of P2 at rate of 322 lb. per acre in both seasons; practically all mixtures showed increases over no manure, and so also did superphosphate alone.

The most consistent varieties have been Factor and Redsnooth, with Elliott's Pink Eye conspicuously successful in its initial sowing this last season.

Neville.—The experiments at this centre consisted of a variety trial and competition among members of the Neville Agricultural Bureau in the 1924 season, and variety and manurial trials in 1925 season. Farmers were invited to furnish their favourite varieties in a comparative trial with varieties submitted by the Department of Agriculture. The trial was sown on new ground, a red basaltic loam, which at sowing time, 21st November, was in excellent tilth. The season was particularly favourable in this locality, and the growth of haulms was particularly luxuriant. Rutherglen bug was bad on the early kinds in December and January, and they were considerably reduced in yield. The Departmental varieties outyielded the local

ones: Symington 11 tons, and Langworthy 10 tons 9 cwt. per acre, were followed by Monaro Marvel (N. Brook) 9 tons 7 cwt., Surprise (F. Goodacre) 8 tons 16 cwt., Monaro Marvel (J. W. Osborne) 8 tons 7¼ cwt., Imperator (B. C. Meek) 8 tons 5 cwt., Early Manhattan (B. C. Meek) 7 tons 9¾ cwt., and Early Manhattan (J. W. Osborne) 7 tons 1 cwt.

The 1925 experiments were sown on 12th November, 1924, on similar class of soil, and following oats the previous year. Superphosphate at rate of 2½ cwt. was applied to all varieties. The manurial trial was sown with Langworthy. Heavy rain set the ground just after sowing, and heavy summer rains and early frosts reduced the yields considerably. Moth attack and scab were noticeable in these experiments. The increases due to fertiliser were considerable, particularly with P7, which with 252 lb. per acre gave nearly a 2-ton increase. The smallest increase was with P2, and amounted to 1 ton 3½ cwt. per acre. Langworthy and Symington again yielded very well, and together with Factor and Elliott's Pink Eye would appear to be suitable varieties for this locality. Redsnooth suffered in comparison with other varieties in this season's trial owing to poor germination.

Springside.—Variety trials were sown in both seasons on red loam soil previously cropped with peas. Sowings were made on 23rd November, 1923, and 24th December, 1924, in rows 3 feet apart, and with superphosphate at 3 cwt. per acre, through the wheat drill. Rutherglen bug and potato moth reduced the yields of early varieties in 1924, and early frosts and heavy rain adversely affected all varieties last season.

Symington and Elliott's Pink Eye have given the best yield in the two seasons, and Late Manhattan, Factor, and Langworthy are also recommended on their behaviour in these and previous experiments. The new varieties Great Scott, Irish Cobbler, Irish Queen, and Lochar have not yielded up to expectations.

Huntley.—Trials were conducted only in 1924–5 season, being sown on red volcanic loam on 13th December, 1924, in rows 2 feet 9 inches apart. Superphosphate at 1½ cwt. per acre was applied with the varieties. The ground, which had previously been under swedes, was in excellent condition at sowing time. Germination of all varieties was satisfactory with the exception of Redsnooth, which had to be cut for planting, and rotted in the ground. A slight frost in February, and a severe one in April, together with rain at first too heavy and towards end of March and April too light, caused yields to be below normal. Elliott's Pink Eye, Factor, and Langworthy gave highest yields, and Redsnooth tubers of excellent quality and a good yield under the circumstances. Factor with 2½ cwt. per acre only gave an increase of 1 cwt. 3 qrs. per acre over unmanured at this centre.

Hobby's Yards.—Trials were conducted in season 1924 only, consisting of a manurial trial and a seed treatment for scab trials. The former was sown on 19th November with Early Manhattan in rows 2 feet 6 inches apart

and at rate of 7 cwt. seed. The land, after two years' rest from oats, was ploughed the previous spring and worked with harrows during October. Germination was satisfactory, and when the plants were about 9 inches in height the Rutherglen bug made its appearance. After February rains the tops recovered remarkably and made excellent growth. Grasshoppers and potato moth also were present during growth. All the fertilisers showed an increased yield over unmanured, amounting in the case of P3 to 2 tons 15 cwt. 3 qrs. per acre. M3, P3, and P10 showed the best growth in early stages, but P3 and P2 gave best yield and highest percentage of marketable tubers. The treatment for scab consisted of: (1) 1 oz. corrosive sublimate dissolved in 7½ gallons of cold water, and scab infected seed immersed for two hours; and (2) ½ pint formalin added to 7½ gallons water, brought to a temperature of 118 degrees to 122 degrees Fahr., and scab infected seed immersed for two minutes, then covered in a heap with bags for an hour and then spread out to dry. Early Manhattan was used in this experiment. The dipping had very little effect on the tubers as far as germination was concerned

The results and observations of this trial are appended.

Borenore.—This trial was arranged with the Borenore Agricultural Bureau and sown on 26th November, 1924. The land was deep red loam, not previously cropped, and first ploughed in early August to a depth of 7 inches. In October it was harrowed twice, and early in November reploughed and harrowed twice. Superphosphate was broadcasted with drill at 2 cwt. per acre. The harrow and cultivator were employed after planting when necessary.

Germination of all varieties was excellent, except Gold Coin, of which only about 70 per cent. came through. The growth of haulms was luxuriant and particularly so on plots treated with superphosphate. The season was favourable except for dry conditions during March and April. The yields, however, were excellent, and evidence the value of virgin ground, organic matter, and careful and deep cultivation. The results from Late Manhattan, Langworthy, and Factor show their suitability for the district. It would appear also that artificial fertilisers should prove of value in this locality.

Comments.

There has for some time been an insistent demand from potato growers for new varieties to take the place of some of the many old sorts under cultivation, which are frequently said to be "running out." Trials in the last two or three years with imported varieties have not been successful, as witness the behaviour of Great Scott, Irish Queen, Lochar, &c. Outstanding local farmers' elections are Symington, Elliott's Pink Eye, and Redsmooth, and these give every promise of supplanting some of the old varieties.

The direction in which it appears the greatest headway can be made is in improving existing varieties by hill selection—an undertaking which the potato grower can and should perform.

Yields of Potato Variety Trials.

	Carcoar.		Oberon.		Neville.		Springside.		Huntley.	Borenore.
Date Sown	14-11-23.	11-11-24.	21-12-23.	3-1-25.	21-11-23.	12-11-24.	23-11-23.	24-12-24.	13-12-24.	23-11-24.
Season	1923-24.	1924-25.	1923-24.	1924-25.	1923-24.	1924-25.	1923-24.	1924-25.	1924-25.	1924-25.
	t. c. qr. lb.	t. c. qr. b.	t. c. qr. lb.	t. c. qr. lb.	t. c. qr. lb.	t. c. qr lb.	t. c. qr. lb.	t. c. qr. lb.	t c. qr. lb.	t. c. qr. lb.
Symington ...	6 12 0 0	3 4 1 4	......	......	11 0 0 0	3 6 1 5	5 1 0 0	4 0 0 0	2 18 0 0	5 13 2 3
Factor	6 8 0 0	2 16 0 16	4 17 2 0	1 10 1 14	......	3 12 1 8	4 18 0 0	1 18 0 0	3 2 1 6	6 17 0 12
Elliott's Pink Eye	5 6 3 0	2 19 2 8	......	3 0 3 0	......	3 18 3 0	7 0 2 0	2 14 0 0	3 16 0 22	6 17 0 12
Langworthy ...	5 0 2 0	3 9 0 0	3 6 2 14	1 4 0 12	10 9 0 0	3 15 2 4	5 0 3 0	2 8 0 0	3 5 2 10	8 2 1 4
Late Manhattan ..	4 16 0 0	......	4 1 1 0	......	......	2 14 1 0	4 10 2 0	2 12 0 0	2 18 2 10	8 4 0 24
Early Manhattan	4 2 2 0	2 12 2 0	......	......	7 9 3 0	......	3 10 2 0	2 0 0 0	......	6 6 2 0
Early Manistee ...	2 13 3 0	......	3 12 1 7	0 18 0 0	4 13 2 0	......	2 8 0 0	......	......	......
Teasdale ...	......	2 10 0 14	4 9 1 14	......	......	......	......	......	......	......
Redsnooth ...	......	2 16 0 0	4 4 2 0	2 0 1 10	......	......	......	3 0 0 0	2 19 0 0	......
Satisfaction ...	......	......	......	......	3 15 2 0	1 6 0 0	......	......	......	......
Red Ruby ...	......	......	3 5 0 0	......	......	......	......	......	......	......
Batlow Cross ...	......	......	3 8 0 0	......	......	......	......	......	......	......
Early Rose ...	......	......	4 2 0 0	1 8 1 4	......	......	......	......	......	......
Dakota Red ...	......	2 2 0 10	......	......	......	......	......	......	2 19 2 0	......
Lochar	......	......	......	......	......	......	1 6 0 0	......	......	......
Irish Queen ...	......	......	......	......	......	......	0 18 0 0	......	......	......
Gold Coin	......	2 5 0 0	......	......	......	1 7 1 8	......	0 18 0 0	2 15 1 6	4 9 1 16
Irish Cobbler ...	......	1 16 2 0	......	Failed	......	Failed	......	0 10 0 0	......	......
Great Scott ...	......	......	......	......	......	......	0 16 0 0	......	......	......

Increased yields can also be obtained by the employment of a more systematic rotation of crops. The value of organic matter is not sufficiently recognised. In portion of the central west the pea crop is quite as important as the potato, and these two make an excellent rotation. It is desirable that the potato crop be preceded by a leguminous crop, such as clover or peas, and every endeavour should be made to augment the soil's supply of organic matter. A frequent cause of depleted yields, and the reason for the "running out" of varieties, is the haphazard selection of seed for sowing. Continual selection in the barn of the smallest tubers for seed can only lead to a deterioration of the variety. Hill selection in the field when digging is the only safe means of maintaining the vigor and vitality of a variety.

YIELDS of Potato Manurial Trials.

Fertiliser.	Amount per acre.	Hobby's Yards, E. Manhattan, sown 19-11-23.	Oberon, Early Rose. Sown 22-12-23.	Oberon, Early Rose. Sown 3-1-25.	Neville, Langworthy, sown 12-11-24.
	lb.	t. c. qr. lb.	t. c. qr. lb.	t. c. qr. lb.	t. c. qr. lb.
No manure	......	6 13 3 0	3 12 2 18	1 6 2 11	1 4 2 16
P1	322	7 17 1 0	3 14 1 4	1 15 3 10	2 16 1 0
P2	322	8 16 1 0	4 5 0 14	1 18 1 9	2 8 0 24
P3	448	9 9 2 0	3 12 1 7	1 17 2 3	2 16 3 4
P10	364	8 1 0 0	4 4 2 7	1 7 3 21	2 10 1 12
M3	364	8 12 2 0	4 1 1 10	1 8 2 12	2 18 3 20
M13	364	7 17 2 0	3 5 0 0	1 14 0 25	3 0 1 0
Superphosphate ...	280	8 1 2 0	4 2 0 0	1 8 1 4	2 9 1 2
Basic Superphosphate	280	8 8 3 0	......	......	......
P7	252	......	......	1 16 1 17	3 4 1 4

The fertiliser mixtures are made up as follows :—P1, one and a-half parts sulphate of ammonia and ten parts superphosphate; P2, ten parts superphosphate and one and a-half parts sulphate of potash; P3, three parts sulphate of ammonia, ten parts superphosphate, and three parts sulphate of potash; P10, one and a-half parts sulphate of ammonia, ten parts superphosphate, and one and a-half parts sulphate of potash; M3, three parts sulphate of ammonia and ten parts superphosphate; M13, ten parts superphosphate and three parts sulphate of potash; P7, superphosphate and bonedust in equal parts.

VARIETY and Manurial Trials.

Varieties.	Borenore, sown 26-11-24. Superphosphate 2 cwt. broadcast.	Borenore, sown 26-11-24. No manure.	Huntley, sown 13-12-24. Superphosphate 2 cwt.	Huntley, sown 13-12-24. No manure.
	t. c. qr. lb.	t. c. qr. lb.	t. c. qr. lb.	t. c. qr. lb.
Early Manhattan	6 6 2 0	5 9 2 12	......	......
Langworthy	8 2 1 4	8 3 0 4	......	......
Late Manhattan	8 4 0 24	8 3 1 20	......	......
Elliott's Pink Eye	6 17 0 12	6 18 1 4	......	......
Factor	6 17 0 12	7 17 0 6	3 2 1 0	3 0 2 0
Symington	5 13 2 3	5 6 1 24	......	......
Gold Coin	4 9 1 16	3 4 0 16	......	......

EXPERIMENT for control of "scab," Hobby's Yards.

Treatment.	Yield per acre.	Conditions.
	t. c. qr. lb.	
Corrosive sublimate ...	7 10 0 0	5 per cent. slightly affected
Formalin	7 6 1 0	7 „ „ „
Untreated	6 17 2 0	26 „ slightly to badly affected.

Southern Tablelands.

R. N. MAKIN, Senior Agricultural Instructor.

During the past season, experiments in potato-growing were carried out in the Crookwell district, the following farmers co-operating with the Department:—

O. Storrier, Cotta Walla.
C. E. Prell, Gundowringa.

The season was a peculiar one. Good rain was experienced before and after planting, but temperatures were low and hard frosts were experienced right up to Christmas; consequently the growth was retarded. Trials with varieties were conducted on both properties, and a manurial test was made at Cotta Walla. In each case the soil was of the light red class, typical of the potato-growing soil in the district.

Among the varieties, Gold Coin and Irish Cobbler were tried for the first time on the experimental plots in the district. The most promising variety under test was Batlow Redsnooth. As its name indicates, it is red-skinned (a colour which commands more attention in the Sydney market), it is smooth, of good shape, and has shallow eyes. Irish Cobbler and Gold Coin are white-skins, and are early in maturity; they will possibly suit coastal conditions, and it may suit Tableland growers to grow seed for the coastal growers. The other varieties have been under trial before, and have previously been described and commented upon. Factor and Up-to-date are still very popular.

RESULTS of Fertiliser Trials.

	1923–24				1924–25.			
	t.	c.	q.	lb.	t.	c.	q.	lb.
Superphosphate, 5 cwt. per acre	8	0	1	24	7	18	0	20
Superphosphate, 2½ cwt. „	9	14	2	3	7	13	0	0
P1*, 3 cwt. per acre	9	17	2	0	7	18	1	0
No manure	7	17	2	0	3	19	1	16

* P1* mixture comprises 10 parts superphosphate to 1½ parts sulphate of ammonia.

The manurial test at Cotta Walla produced further information as to the value of artificial fertilisers for potatoes; it is interesting to note the yields during the past two seasons with the same class and quantities of fertilisers.

In 1923–24, on the farm of Mr. C. Howard, Crookwell, the variety of potato used was Surprise, while in the past season that used on Mr. Storrier's farm was Up-to-date.

These figures reveal that the heavier dressing of superphosphate is not justified. It is questionable whether the use of sulphate of ammonia is justifiable, as the increased return is small.

The question, manure or no manure, needs no comment, except that to-day no potato-grower who is wide awake disputes the value of fertilising the crop.

RESULTS of Variety Trial.

Cotta Walla.					Crookwell.				
Planted, 15th to 17th November. Harvested, July.					Planted, 21st November. Harvested, May.				
	t.	c.	q.	lb.		t.	c.	q.	lb.
Up-to-date	3	10	0	24	Gold Coin	7	5	0	0
Elliott's Pink Eye	2	14	2	16	Batlow Redsnooth	5	5	0	0
Satisfaction	3	5	0	0	Irish Cobbler	4	15	0	0
Manhattan	4	9	2	18	Dakota Red	4	1	0	0
Gold Coin	4	12	1	8	Satisfaction	8	0	0	0
Factor	5	12	2	6					
Batlow Redsnooth	5	15	2	20					
Dakota Red	2	18	2	0					

The effective rainfall, covering the period of growth, was as follows:—

	points.
November	440
December	161
January	331
February	163
March	109
	1,204

Northern District.

MARK H. REYNOLDS, H.D.A., Senior Agricultural Instructor.

In the northern district, potato-growing is mainly confined to the country north of Tamworth to the border of the State, and about 15 miles on either side of the main northern railway. The elevation is from 2,000 to 5,000 feet, and rainfall generally sufficient. This section is known as New England. The soils are mostly of basaltic origin, and of good fertility.

The season 1924–25 was notable for the excessive rains from November to January. Weed control was difficult; *Amaranthus paniculatus*, that pest of the Tablelands farmer, known variously as Boggabri, red leg, wild amaranth, &c., overran many crops of potatoes and maize, causing a considerable reduction in yield. This weed is a prolific seeder, and necessitates occasional bare fallow for a full season to keep it under control.

With the exception of Red Range, potatoes were but slightly affected with blight. Other insect and fungous pests were little in evidence.

The following farmers conducted trials of varieties and fertilisers in co-operation with the Department:—

J. B. Howell, Red Range, *via* Glen Innes.
J. Walmsley, Red Range, *via* Glen Innes.
Parson Bros., Dangarsleigh, *via* Armidale.
J. Hill, Redbank Farm, Guyra.
J. W. Jay, Ben Lomond.

RAINFALL during Growing Period.

	Red Range		Armidale.		Ben Lomond.	
	No. of days.	Points.	No. of days.	Points.	No. of days.	Points.
October	...	...	...	...	2	165
November ...	3	250	9	233	11	587
December ..	11	960	7	264	6	333
January	12	690	14	294	8	585
February ...	..	...	10	131	5	336
March	...	...	11	199	5	213
April	. .	...	9	42	3	35

Details of Experiments.

Red Range (J. B. Howell).—Plots were located on gently sloping uplands. Soil, red loam, of basaltic origin. Land under pasture for fifteen years. Ploughed 6 inches deep during the first week of August, 1924, and well harrowed in September. Subsequently cultivated and drills ploughed 4 inches deep and 2 ft. 9 in. apart for planting. Potatoes planted unmanured, approximately 22 inches apart on 13th November, 1924. Owing to the delay in planting, a quantity of the seed was spongy and overshot, Lochar especially so. Three rows of each variety, 3½ chains long, were planted. The sets were covered with a one-horse cultivator. Subsequent harrowing, cultivating, and hilling were performed up to the flowering of the plants, and the plots were thereby kept comparatively weed free. Varieties were in bloom or had completed flowering on 15th January.

The whole of the tops were destroyed by Irish blight about 20th January, when development of the tubers practically ceased. Great Scott, Early Manhattan, and Scott's Satisfaction, being early-maturing varieties, had made greater development of tubers at this time than the others.

It was noted that the tops of Lochar showed greatest resistance to blight, while Dakota Red and Batlow Redsnooth showed greater resistance than the balance of the varieties tried.

The benefit of good hilling in keeping the soil close about the plant and providing ample cover for the tubers was evidenced by the slight affection of the tubers. In Lochar and Dakota Red none were affected, and only rare tubers were found affected in the balance. It is considered advisable to plant potatoes as early as possible at Red Range, and to use early-maturing varieties, so as to minimise the effect of Irish blight, which is prevalent in the majority of seasons. Spraying with Bordeaux mixture as a preventive is not practiced, but is well worth consideration.

Red Range (J. Walmsley).– A manurial trial was conducted on upland country that gently sloped to the north. Soil, red, basaltic loam. Land previously cropped with oats in 1923–24, no fertiliser being added to the soil; ploughed 7 inches deep in July, and left in rough condition; deeply cultivated with springtooth cultivator early in November. Queen of the Valley variety planted on 20th November in rows about 32 inches apart, the fertiliser being spread by hand about the sets. The field was harrowed shortly after the potato tops appeared, and later on cultivation was given between the rows. On 15th January (flowering time) the potatoes were hilled with a plough. An inspection in January showed greatest vigour in the M3 section and generally on the fertilised plots. About one week later the whole of the tops were dead with Irish blight, when tuber development practically ceased. The tubers were practically free from disease.

Dangarsleigh.—Plots situated on upland sloping country. Soil, a black clay, self-mulching loam of basaltic derivation. The land had not previously been cropped. Cultivation began with a 4 to 5 inch ploughing in July; subsequent weathering and cultivation put the land into good condition for planting. Whole and cut sets were spaced about 22 inches apart, in rows 32 inches apart. Planting was done on 11th November, the variety trial being unmanured. The seed of varieties Great Scott, Gold Coin, Lochar, and Golden Wonder were much shot and spongy, due partly to being mature about eight months before planting. A considerable portion of the Great Scott seed was rotted.

The best quality seed was that of Dakota Red, Satisfaction, and Surprise. In all varieties except Factor, Lochar, Surprise, Dakota Red, and Satisfaction a number of sets died. The potatoes were not affected by disease. In harvesting allowance was made for the vacant spaces.

Guyra.—Variety and manurial trials were conducted on upland country, somewhat level. Soil, red basaltic loam. In 1922 potatoes were grown with an application of a mixed fertiliser, a 3-ton crop being harvested. In 1923 oats were sown with 70 lb. superphosphate per acre, and yielded 30 cwt.

of hay per acre. In preparation for the experiment, the self-sown oats were fed off by sheep, and the land ploughed 6 inches deep on 5th May; left fallow until September, then once harrowed, no growth having appeared since the ploughing. The potatoes were planted on 24th October. In addition to the varieties supplied, the experimenter grew a number which were the progeny of varieties brought from Great Britain some years ago or tested previously. In all eighteen varieties were grown. Six different fertiliser mixtures were tested, with unmanured sections as checks. The growth was satisfactory, and promised well until early in January, when a sharp frost cut the tops right back. Little growth had taken place, and only small potatoes of marble to seed size were harvested.

Ben Lomond.—Variety and manurial trials were conducted on uplands, portion sloping gently to the west and portion to the north-east. Soil, red basaltic loam. In 1922 and 1923 oats were grown both seasons, without manure. Land ploughed mid-September, 1924, 8 inches deep; harrowed fourteen days later, and harrowed with heavy harrows just prior to planting. The potatoes were ploughed in, and the land harrowed a few days later. Generally the potato sets were overshot and soft. Planting was done on 23rd October, in rows 32 inches apart, sets 20 inches apart. Subsequent cultivation and hilling was performed efficiently. The potatoes were fully mature on 16th April, and comparatively free from disease. The dry spell and hot winds during the latter part of December appeared to affect the fertilised plots more severely.

RESULTS of Variety Trials.

Variety.	Red Range.		Dangarsleigh.		Ben Lomond.	
	Table Potatoes.	Percentage Seed.	Table Potatoes.	Percentage Seed.	Table Potatoes.	Percentage Seed.
	t. c. q.		t. c. q.		t. c. q.	
Early Manhattan	4 3 1	20	...	...	..	...
Lochar	2 10 1	42	...	...	...	...
Golden Wonder	0 16 1	72	0 18 0	76	1 11 1	66
Batlow Redsnooth	1 12 2	43	...	...	4 18 1	34
Great Scott	5 15 2	31	...	...	4 13 3	42
Scott's Satisfaction	3 14 1	37	...	...	...	...
Symington	2 8 3	38	7 2 3	16	5 17 0	21
Dakota Red	2 2 2	43	4 9 1	23	6 5 0	22
Factor	3 7 0	41	2 18 0	53	6 12 3	41
Surprise	...	...	5 16 0	16	5 8 1	26
Coronation	...	...	3 11 1	45	4 4 1	43
Gold Coin	...	...	4 0 1	42	4 7 0	37
Parson's Satisfaction	...	...	4 4 3	37	...	...
Satisfaction	...	...	...	...	3 12 2	40
Teasdale	...	...	...	...	6 5 0	33
Queen of the Valley	...	...	...	...	4 9 1	42

RESULTS of Fertiliser Trials.

Fertiliser.	Armidale. Table Potatoes.	Armidale. Percentage Seed.	Red Range. Table Potatoes.	Red Range. Percentage Seed.	Ben Lomond. Table Potatoes.	Ben Lomond. Percentage Seed.
	t. c. q.		t. c. q.		t. c. q.	
P3 (448 lb. per acre)	3 11 1	47	2 4 2	58	6 5 0	43
M3 (364 lb.)	3 11 1	45	2 18 0	46	4 18 1	47
Unmanured	3 13 2	44	{ 1 15 2 1 11 1	60 54 }	5 15 0	36
M13 (364 lb.)	3 13 2	44	1 11 1	59	4 0 1	46
Superphosphate (280 lb.) ...	4 9 1	34	2 4 2	43	5 1 1	44
P2 (322 lb.)	...	...	1 9 0	65	...	...
P1 (322 lb.)	...	...	1 18 0	57	...	...

Varieties used in the trial:—At Armidale, Satisfaction; at Red Range, Queen of the Valley; at Ben Lomond, Coronation.

Composition of fertiliser mixtures:—P3 consists of 10 parts superphosphate, 3 parts sulphate of ammonia, 3 parts sulphate of potash; M3 consists of 10 parts superphosphate, 3 parts sulphate of ammonia; M13 consists of 10 parts superphosphate, 3 parts sulphate of potash; P2 consists of 10 parts superphosphate, 1½ parts sulphate of potash; P1 consists of 10 parts superphosphate, 1½ parts sulphate of ammonia.

For the amounts used in the various trials, the approximate costs per acre of the different fertilisers and freight to New England railway towns was:—P3, £2 8s.; M3, £1 12s.; superphosphate, 16s.; P1 and P2, each £1 4s.

MORTALITY AFTER SHEARING.

REPORTS of the occurrence of tetanus among newly-shorn sheep have been received from several districts. Tetanus in such circumstances is usually contracted by infection of the wounds of the newly-shorn animals picked up in the sheds and yards when these have been in a dirty condition and contaminated by accumulation of fæces from the previous shearing. Where tetanus has occurred particular care should be taken before next shearing that both the sheds and yards are thoroughly cleaned and disinfected.

Scrubbing down the sheds with strong disinfectant is suggested, and a thorough cleaning out of the pens and yards which receive the newly-shorn sheep. This cleansing should include the removal of accumulated dung and the top layer of soil, dressing the yards with chloride of lime and replacing the removed soil with fresh soil, preferably obtained from some situation on which sheep are not continuously running; avoid any position which has been utilised as a sheep camp. Marking and tailing should not be carried out in any set of yards in which tetanus has occurred until such cleansing operations have been effected.

The disease usually makes its appearance among sheep from three days to three weeks after shearing. If valuable stud rams are to be shorn in the shed in subsequent years, the desirability of administering a preventive dose of tetanus anti-toxin is worth consideration.—MAX HENRY, Chief Veterinary Surgeon.

Field Experiments with Maize.

Grafton Experiment Farm.

Rate of Seeding Experiments, 1919-25, Summarised.

G. NICHOLSON, H D.A., Experimentalist.

Some doubt exists as to what is the most suitable rate of seeding for Leaming or similar early varieties of maize for the Clarence River district. No hard and fast rule can be laid down, for much will depend on seasonal conditions and the class of soil the crop is grown on. In seasons when the rainfall is favourable to the maximum development of the plant it is to be expected that the best yields will result when thick seeding is practised, while in unfavourable seasons the opposite will obtain.

With a view to collecting definite data on the subject an experiment was commenced at the above farm in 1919, to ascertain the most profitable rate of seeding with Leaming maize over a period of years. That correct conclusions may be drawn it is essential not only that the actual yields from the various rates of seeding be considered, but that other factors, which may have considerable bearing on the actual net profit, be reckoned with. It is obvious that thick seeding means more seed for planting, and results in a greater number of cobs to harvest, husk, and thrash. All these items will entail extra labour costs; therefore any increased yield must be sufficient to more than cover these expenses before such a rate of seeding can be considered profitable. In arriving at each year's results this plan has been followed, and the cost of seed, harvesting, husking, and shelling, and the value of the crop have all been recorded.

An experiment to determine the most suitable distance apart to space the rows was carried out during the years 1915 to 1918. Taking all factors into consideration it was found that, as a general rule, the best results could be expected when the rows were spaced 4 feet apart. It was found that this spacing allowed for a good development of the plant and facilitated the cultivation of the growing crop; it was accordingly adopted in the experiment now described. This consisted of five plots, and was laid down as follows:—

Plot 1.	Three grains	every	40	inches	in rows 4 feet	apart.	(Check).
,, 2	,,	,,	32	,,	,,	,,	
,, 3	,,	,,	28	,,	,,	,,	
,, 4	,,	,,	20	,,	,,	,,	
,, 5	,,	,,	40	,,	,,	,,	(Check).

In each season the maize dropper was used to plant the experiment. Almost the exact distances can be obtained with the dropper, using a five-hole plate (each hole to accommodate three grains), and the six, nine, ten, and

thirteen-tooth sprocket wheels on the seed box axle for 20-inch, 28-inch, 32-inch, and 40-inch spacing respectively. In the following table are shown the amounts of seed required for the various rates of sowing for each year :—

Rate of Seeding	1919–20	1921 22	1922–23.	1923–24.	1924–25.	Average
inches.	lb.	lb.	lb.	lb.	lb.	lb.
40	6·5	6·1	7	6 5	7·16	6·65
32	8·1	7·6	8·5	8·25	8·72	8·23
28	9·3	8·7	9·75	9	9·8	9·31
20	13·0	12·2	14·0	12·5	13·7	13·1

The experiment was conducted on dark creek alluvial soil, which is a little less fertile than the alluvial soils of the Clarence River district. Cultivations before and after planting were uniform for all plots, and such as to ensure that the ground was in good order. Planting was carried out each season about the middle of November. No fertilisers were used.

Notes on the Seasons.

1919–20.—Experiment planted for the first time. Seasonal conditions were favourable, 20 inches of rain, evenly distributed, falling from December to April. Growth was good throughout, particularly in the more thickly seeded plots, which did not sucker as freely as those sown at lower rates. The highest yields were obtained from the 28-inch and 20-inch spacings.

1920–21.—Owing to the plots being flooded during the winter of 1921 much of the maize was destroyed, and it was impossible to obtain comparable yields.

1921–22.—The rainfall for the growing season was good but somewhat erratic. Seven inches of rain fell in December, followed by a hot and practically rainless January. Conditions were again favourable during February, when nearly 10 inches were recorded. The more thickly seeded plots suffered most as a consequence of the dry spell in January, and the best yields were obtained from the thinner seeded plots.

1922–23.—The rainfall for the summer months was below the average. Precipitations consisted for the most part of light showers, and were followed by hot westerly winds, consequently yields were low. The thickly seeded plots suffered considerably owing to the dry weather, and the results showed increases up to 13 bushels in favour of thin seeding.

1923–24.—Seasonal conditions were fairly favourable, 14 inches of rain falling from December to April. The results are not in keeping with those of previous years; 20-inch spacing gave the highest yield, and 28-inch spacing the lowest, there being a difference of nearly 10 bushels between the two plots.

1924–25.—Apart from one hot dry spell during February, which caused considerable damage in the thickly seeded plots, seasonal conditions were most favourable. The variation in yield between thick and thin seeding was only small, slightly favouring the former. Yields from the more heavily

seeded plots would have been greater had it not been for the dry weather in February. This was partly responsible for a large number of stalks breaking down, resulting in moulding and rotting of the cobs. The 20-inch spacing suffered most in this respect.

SUMMARY of Results.

Rate of Seeding.	Average Yield for Five Seasons.	Difference Due to Closer Spacing.	Value of Difference.	Cost Involved.			Net Loss.
				Through Extra Seed.	Through Extra. Labour.	Total.	
inches.	bus. lb.	bus. lb.	s. d.	s. d.	s. d.	s. d.	s. d.
40	54 4	....	....	......	......	......	......
32	55 13	1 10 gain	5 10 gain	0 4	7 4	7 8	1 10
28	53 14	0 50 loss	4 9 loss	0 7	8 11	9 6	14 3
20	54 21	0 13 gain	1 3 gain	1 3	11 10	13 1	11 10

Conclusions.

Reviewing the average results for the five years, it will be seen that the variation in yield is small; in fact, it is insufficient to cover any experimental error. As pointed out before, however, there are other factors besides yield to consider. Taking into account the additional costs involved for extra seed and labour, it will be seen that the difference between 40-inch seeding and 20-inch seeding amounts to 11s. 10d. per acre in favour of the former rate. It is evident that heavy seeding will mean a larger number cobs produced per acre, but these are so reduced in size as to be only equal to a lesser number of cobs from a medium rate of seeding. Another point worthy of consideration is that should the crop be required for seed purposes it will be found that the percentage of seed cobs obtained will be considerably greater from the medium or thin seeding. As a general rule it may be expected that heavy seeding will return the highest yields in good years and *vice versa* in dry seasons. It is impossible accurately to forecast seasonal conditions, in which circumstances it would appear that a 40-inch or 32-inch spacing in rows 4 feet apart will be the most profitable rate to adopt.

HAWKESBURY AGRICULTURAL COLLEGE STUDENTS.

ON completion of the College Diploma Course in Agriculture at the end of the year, several students at Hawkesbury Agricultural College are desirous of gaining further practical experience on stations and farms. These lads (about 19 to 21 years of age) have received a thorough grounding in the theory and practice of agriculture during the three years they have been in residence, and can be recommended to station-owners and farmers desiring their services. Apart from those who have completed the three years' course, there are students who have completed one or two years' agricultural training and who desire to secure employment during the College vacation (17th December to the end of the following month). Correspondence on the subject might be directed to the Principal, Hawkesbury Agricultural College, Richmond.

Farmers' Experiment Plots.

MAIZE TRIALS, 1924–25.

Lower North Coast.

J. M. PITT, H.D.A., Senior Agricultural Instructor.

OWING to a slump in maize-growing, noticeable throughout the district, there was a falling-off in the number of plots inquired for and sown during the season. The following farmers co-operated :—

F. K. Ward, Bowraville, Nambucca River.
E. H. Ducat, Temagog, Macleay River.
J. Campbell, Wingham, Manning River.
J. Nixon, Nabiac, Wallamba River.
C. Minnett, Lansdowne, Manning River.
A. M. Hooke, Langley Vale, Manning River.
H. Delves, Ross Glen, Camden Haven River.

Pure-seed plots were sown by F. Waters, F. K. Ward, T. H. Hodgins, J. G. Perrett, J. P. Mooney, E. Mulholland, S. Flett, W. Macdonald, G. Crew, and P. Barry at various centres throughout the district.

The season was remarkable, first of all, for the very dry, late spring, and then for continuous heavy rain throughout the remainder of the year. Most of the early sown plots suffered through dryness, and there was altogether too much rain for some plots in unfavourable situations, causing yellowness, lodging, and decreased yields. Still, some very heavy yields were harvested.

The Plots.

At Bowraville, on a very fine sandy, loam soil, Fitzroy and Manning Silvermine were the best of the main varieties, whilst Craig Mitchell and Golden Superb for early varieties yielded very well. The spring here was not as dry as in other places. It may be mentioned that Craig Mitchell topped the yields here last season, and appears to be a very suitable early variety for the neighbourhood. On this class of soil maize responds well to the application of fertiliser, and the difference in growth between the unmanured and manured plots was even more pronounced than the actual yields.

The soil at Temagog was a rich alluvial loam and in good order. Golden Superb is the chief early variety sown here. Several of the newer varieties yielded better, but they were mostly very weevily. Auburn Vale, Funk's 90-day, and Craig Mitchell were the best.

The Lansdowne, Langley Vale, and Ross Glen plots were sown on totally different country, the soil being less fertile than that on the previously mentioned farms, and the subsoil closer to the surface. At Ross Glen particularly the soil is of a peaty nature and very retentive. In extreme seasons these areas do not yield well. There were no outstanding yields, Golden Superb, 59 bushels, being the best at Lansdowne. The unfertilised plot at Wingham yielded better than the fertilised. Rain fell shortly after sowing, and it is believed that the grain coming in contact with the dissolved fertiliser (spread by hand) had a detrimental effect on the young rootlets. At Nabiac a heavy hailstorm caught the variety trial just coming through. This, with the heavy rains following, helped to decrease the yields considerably. The early varieties did equally as well as the main types.

In the fertiliser trial, sown a little later, the conditions were better. The superphosphate plot yielded the best.

The following rainfalls were registered at two important centres:—

1924.	Kempsey. Pts.	Taree. Pts.	1925.	Kempsey. Pts.	Taree. Pts.
Aug. ...	179	184	Jan. ...	284	366
Sept. ...	164	233	Feb. ...	385	151
Oct. ...	231	139	Mar. ...	769	456
Nov. ...	597	732	April ...	248	346
Dec. ...	322	710	May ...	794	1,094

RESULTS of Variety Trials.

	Name of Centre and Date Sown							
	Bowraville. (22-9-24)		Temagog. (9-10-24.)		Lansdowne. (29-9-24.)		Nabiac. (24-10-24.)	
	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.
Large Red Hogan	102	42	......		......		58	32
Fitzroy	116	14	......		......		52	40
Leaming	93	42	......		......		64	24
Manning Silvermine	113	14	......		......		......	
Golden Beauty	......		......		......		58	32
Yellow Hogan	......		......		......		61	28
Pride of Hawkesbury	......		......		......		49	44
Coodra Vale	71	24	......		35	0	......	
Funk's Yellow Dent	75	42	80	2	37	0	61	38
Golden Superb	105	0	74	6	59	0	58	32
Craig Mitchell	105	0	89	37	32	0	70	16
Bailey	......		88	52	......		......	
Funk's 90-Day	......		90	23	......		52	46
Wellingrove	......		84	27	35	0	......	
Goldmine	......		71	8	......		......	
Auburn Vale	......		97	46	40	0	......	
Farmer's Golden Superb ...	......		74	47	......		......	
Iowa Silvermine	......		......		......		64	24

RESULTS of Fertiliser Trials.

Fertiliser.	Wingham.	Bowraville.	Nabiac.
	bus. lb.	bus. lb.	bus. lb.
No manure	80 2	73 28	82 0
Superphosphate, 140 lb.	66 39	91 28	101 2
M7, 182 lb.	......	97 28	84 52
M6, 224 lb.	......	96 42	89 18
P7, 168 lb.	62 14	90 0	76 8
M13, 182 lb.	65 12	......	......
M14, 224 lb.	77 4	......	......

M7 consists of 10 parts superphosphate and 3 parts chloride of potash; M6, 5 parts superphosphate and 3 parts chloride of potash; P7, bonedust and superphosphate in equal parts; M13, 10 parts superphosphate and 3 parts sulphate of potash; M14, 5 parts superphosphate and 3 parts sulphate of potash.

IMPROVEMENT OF SUGAR CANE BY BUD SELECTION.

THE possibility of improvement of sugar cane by bud selection has been a subject of investigation and trial by Mr. A. D. Shamel, Physiologist of the United States Department of Agriculture, among the sugar plantations of the Hawaiian Islands, and a report of the work issued as a bulletin by the Experiment Station of the Hawaiian Sugar Planters' Association is attracting some attention. The work has been in progress since 1920, Mr. Shamel's services having been loaned to the Hawaiian planters for a part of each year.

Mr. Shamel states that the purpose of the work may be classified under three main divisions:—(1) To conserve and improve the efficiency of proved varieties for the maximum production of sugar through the isolation and propagation of valuable strains and elimination of inferior strains; (2) to originate and develop superior new varieties and strains by selecting, testing, and propagating striking bud mutations; and (3) to develop methods for securing, handling, and using adequate supplies of selected propagating material for plantation use.

In the conclusion the author states: "An attempt has been made in this report to outline our understanding of the present status of the sugar and pineapple bud selection work. While changes and improvements in methods are inevitable, and are to be desired with further experience, it seems to the writer that by the use of the methods described in this report important progress has been made and can be confidently expected in the future. Our ideal is the selection of the best from the best, to the end of improved and more profitable production."

THE outstanding feature of the present winter has been the value of conserved fodder, silage carried over from last year being found of the greatest value during the shortage of winter feed.—C. G F. GRANT, Manager of Berry Experiment Farm.

Hickory King Maize Contest.

Season 1924–25.

H. WENHOLZ, B.Sc. (Agr.), Special Agricultural Instructor.

The Hickory King maize contest, promoted by the Department of Agriculture, and for which 10 guineas prize money is given by Messrs. Clifford Love and Co. Ltd., cornflour manufacturers, Sydney, was again carried out in the past season on three farms under the supervision of the agricultural instructors stationed in coastal districts.

The North Coast plot which was supervised by Mr. M. J. E. Squire was sown on second-class alluvial land on the farm of Mr. F. L. Playford, Nana Glen, on 21st November, 1924. The season was a little dry in the early part, but good rains fell during the later growth.

The Central Coast plot was supervised by Mr. J. M. Pitt, who reports as follows: This contest was sown on alluvial soil on the farm of Mr. J. Campbell, Wingham, on 17th November, 1924. The land had previously grown late maize. It was ploughed with a single-disc plough in September, and disc-cultivated twice. The seed-bed was good and germination excellent, Good growth took place, but the yields were reduced by a mild attack of leaf blight.

The South Coast plot was supervised by Mr. R. N. Makin, who reports: The crop was sown on a typical granite hillside on the farm of Mr. E. Koellner, Bega, on 5th November, 1924. The ground was ploughed and harrowed in the winter, and again ploughed and harrowed prior to sowing. It was in good order at sowing, and the germination was good. The growth of the crop was checked by a mild frost in December, followed by a dry spell, and finally conditions became very wet. The irregular weather conditions were responsible for low returns.

The following table gives the yields from the different plots, and the average yield of each seed on the three farms :—

Results of Contest.

Competitor.	North Coast.		Central Coast.		South Coast.		Average.	
	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.
J. Campbell, Wingham	75	8	88	9	26	14	63	10
H. Cole, Pambula	72	52	66	39	29	49	57	9
J. T. McInerney, Albion Park	53	43	84	27	20	28	52	51
W. Cole, Pambula.....	61	8	70	22	23	35	51	40
J. Britten, Bimbaya	59	37	56	18	28	35	48	11
E. C. Haynes, Bald Hills, Bathurst ...	49	20	60	43	24	14	44	44
J. P. Rily, Cobargo...	51	32	59	16	21	0	43	53
R. Aberdare, junior, Nowra	50	5	51	49	24	0	41	55

The results of this contest serve to illustrate further the benefit of securing new blood of the same variety from other sources to infuse vigour into one's seed maize. Mr. Campbell had the advantage during the previous season of growing seed from many competitors of the previous year on his land, and selected seed from this crop for the present contest. Hickory King probably responds better than any variety of maize to this treatment, because, being of such a pronounced and definite type, it is more likely to become inbred or closely bred, and a sudden outcrossing with new blood raises the vigour and the yield very appreciably.

Mr. Campbell wins two guineas each for the best yield on the North and Central Coast plots, and three guineas for the best average yield, making seven guineas in all.

Mr. H. Cole, Pambula, wins two guineas for the best yield on the South Coast plot, and one guinea for the second best average, making a total of three guineas.

It has been decided to hold this contest in future every alternate season, and the next contest will be in 1926–27. Full particulars will be given in later issues of *Agricultural Gazette.*

THE NOMENCLATURE OF QUEEN BEES.

THE names given to queen bees relative to their kind and quality do not convey an adequate description. The following elucidation of the terms generally used may therefore be useful to bee-keepers :—

Ripe Queen Cell.—A cell in which a young queen is being reared in its fourteenth to sixteenth day of development. The virgin usually emerges on the sixteenth day.

Virgin Queen.—An unmated queen from four to six days old.

Drone-laying Queen.—A queen, which through any cause has been prevented from leaving the hive on her nuptial flight—usually when five to eight days old—and which starts to lay eggs all of which produce males.

Exhausted Queen.—An old queen in which the supply of spermatozoa received at mating is spent, indicated by her aged appearance and the development of numbers of drones in worker cells.

Untested Queen.—A purebred queen that has been mated and whose brood consists of both workers and drones. The absolute proof of fertility is not assured until the brood is capped over. When her progeny begins to emerge such a queen may prove to have mated purely or to have mismated.

Mismated Queen.—A purebred queen the markings of whose progeny indicate that she has mated with a drone of a different race; such a queen's drone offspring are pure, but her workers are hybrids.

Tested Queen.—A queen that has mated with a drone of her own species, indicated by the correct colour marking on the bodies of her progeny.

Select Tested Queen.—A queen that is selected (1) for all round excellence in quality in herself, *i.e.*, in size, shape, colour, and work, and (2) for correctness of colour marks above and beneath the abdomen in her progeny, showing purity of mating and also evenness of size.

Breeding Queen.—Such a queen has all the characteristics of a select tested queen, but has been kept for one or two years, and has proved the superiority of her progeny by any or all of the following qualities—storing, wintering, building up, stamina, disease resisting, and quietness. A strain is sometimes found with a fixity of character that makes it safe to select breeders at one year old.

—H. GRAHAM SMITH, Apiarist, Hawkesbury Agricultural College.

The Sweet Potato.

A. J. PINN, H.D.A., Special Agricultural Instructor.

THE sweet potato does not receive the attention in this State that it deserves, notwithstanding that its cultivation calls for no special consideration. It may be grown in localities unsuitable for the ordinary potato, and in other parts it will do well at a time of the year when the weather is too hot for the better known crop.

Apart from the demand for the crop for culinary purposes, both for home use and for sale on the open market, the utility of the roots as feed for stock is also worthy of attention. The crop should receive special consideration, for instance, from farmers who are concerned in the raising of pigs, as the heavy yields obtained make it an important supplement to the skim milk or other diet usually in vogue. Apart from the expense of the temporary subdivision of the land, which is essential for the economical feeding-off of the crop, no harvesting costs arise.

While the present market demand for sweet potatoes is not large, there are great possibilities for extension. With a well organised effort, it should not be difficult to create a greater demand for this little-known vegetable, especially if growers are prepared to give greater attention to the cultivation of the better culinary varieties which are now becoming available. These new varieties, although perhaps giving a smaller yield than the coarser and more common types, are of a size and quality that suit the vegetable trade. A great proportion of the sweet potatoes marketed in the past has consisted of large roots which often suggested coarseness by their appearance, and which would have been better suited for feeding to stock than for the vegetable market. Many of the newer varieties, however, produce even-shaped globular roots, free from ridges, which may be marketed in bags without the risk of damage that attaches to the long-root types (such as White Maltese), which are now so common in the market.

Districts and Soils.

The sweet potato crop has been grown on small areas in tableland districts, and has been considered successful, but, generally speaking, its extensive culture cannot be recommended in such parts. It should be remembered that the crop is subject to damage by frost, and as saleable roots are not produced until late in the season, the risk of total loss under cool conditions is too great.

The coastal districts of the State are particularly adapted to the cultivation of the crop. If a little attention is devoted to keeping down weeds and conserving moisture by hoeing, it is surprising how much dry weather the sweet potato will stand.

The ideal soil for this crop is a sandy one which has been well supplied with organic matter. In a soil of this character the plants possess almost the hardiness of weeds, and the roots develop well, being even in quality and of good shape. As the crop is a deep rooter, thorough preparation of the land is necessary.

While roots of the best quality are developed in sandy soils, even the poorer soils of this class produce roots of size and quality suitable for the market. Heavy clay soils are not suited to the commercial cultivation of the crop, as they are inclined to produce ill-shaped roots, and it is necessary to harvest the tubers before winter rains occur or a large percentage of rot will result.

The type of soil also largely affects the appearance of the tubers when harvested. Those obtained from sandy soils present a clean appearance, whereas those grown on heavier clay types may require washing before being forwarded to market.

Sweet Potato "root," with plants ready for breaking off and planting out.

Manuring and Propagating.

On light type soils which have a tendency to set on the surface, the addition of well-rotted farm manure is a distinct advantage.

On raw sandy soils the application of manure and fertiliser is desirable, and satisfactory results should be obtained from applications of 3 cwt. per acre of superphosphate and bonedust mixed in equal quantities. If possible, the fertiliser should be dusted along the line of planting and worked in with a cultivator before the actual planting takes place. On rich soils neither farmyard manure nor fertilisers seem to be essential.

The crop is propagated—not by planting tubers in the field—but by means of shoots or "plants" which grow from the tuber. When bedded or

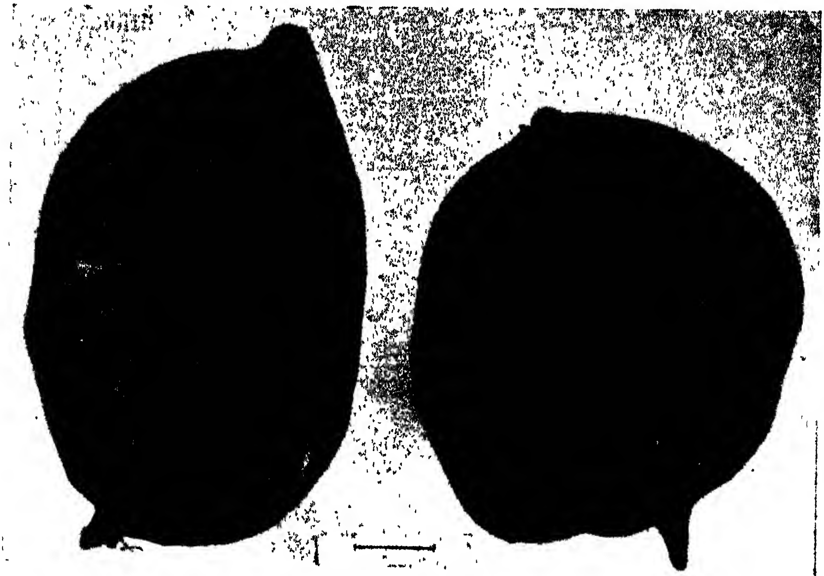
planted, sometimes as many as fifty "plants" will grow from a single small tuber (see accompanying illustration), and two or three pullings may be obtained in a single season.

The plants necessary for producing an early crop are obtained by placing the roots—usually small, slender tubers kept over for this purpose from the previous season—in sand in a cold frame or hot bed. The tubers should be placed close together, but not touching, and then covered with 3 or 4 inches of sand (river sand preferred); the whole bed should then be well watered and covered with a glass sash or frame of hessian. By raising a corner of the

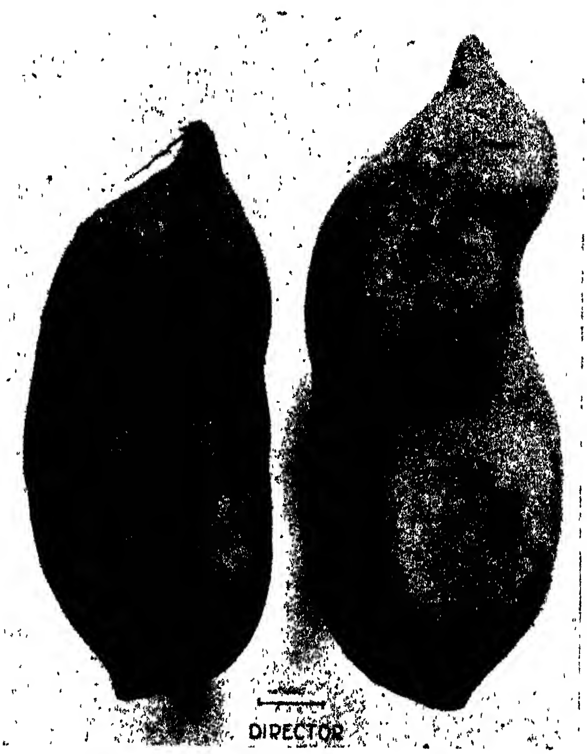
WHITE MALTESE

frame, enough air can be admitted to prevent rot setting in. The bed should be kept moist, but not wet, and covered until the plants show through the sand, when the covering should be removed during the daytime, but replaced at night. This is done until all danger of frost is past. The "plants," when 6 or 8 inches long, are ready for planting out.

By bedding the roots early, the addition of bottom heat is unnecessary in comparatively warm districts. If tubers are set in the frame about the end of July or beginning of August, plants will be ready as early as it is safe to



MAMMOTH CATTLE



DIRECTOR

put them out. Plants raised on sand, and without artificial heat, are hardier than if raised in a rich compost and on a hot bed, and, in addition, the risk of introducing disease is lessened. In a cold district, or where bedding-down has been delayed, it will probably be found necessary to use some sort of bottom heat.

One or two tubers, bedded in a small box or kerosene tin, if placed in a sunny situation, and covered at night, will supply sufficient plants for a kitchen garden.

In mild districts, plants quite early enough for a main crop can be obtained by bedding the tubers in the open ground in a sheltered situation with an easterly aspect, or, cuttings 6 or 8 inches long may be made from the vines of the early-planted crop and set out in the same way as the plants obtained by bedding. These cuttings will grow quite readily, and the crop produced by planting them seems to keep better than the early crop. Small "tubers" are the best for producing plants; 1 cwt. will produce at one "pulling," 4,000 to 5,000 plants, and will occupy 90 to 100 superficial feet in the cold frames.

Planting Out and Cultivation.

The planting is commenced at any time when all danger of frost is past; it can be continued in the coastal districts right up to the beginning of January with every hope of a good crop.

The shoots or plants should be carefully drawn from the bed and put root downwards in a bucket of water or a mixture of cow-dung and water. For planting they should be drawn from the bucket as required and placed 2 feet apart in rows which are 3 feet apart.

The plants may be ploughed in at the time the ground is getting its second or final ploughing. When this method is adopted, the plants are placed the required distance apart in every third or fourth furrow, the necessary covering being given by the plough as it turns the succeeding furrow.

A common plan is thoroughly to prepare the ground first and then dibble the plants in with a spade. This method is somewhat slower than ploughing in, but for ordinary conditions it has been proved the most satisfactory. A man and a boy can plant with a spade 3,500 plants in eight hours.

A point of very great importance when planting by either method is to see that the soil is thoroughly compacted around the plant; this is especially necessary in dry weather. When the plants are dibbled, this compacting is done by pressing the soil firmly against the plant with the foot, and when ploughed in a heavy roller with a large diameter should follow the planting. A roller with a small diameter will drag the plants up. Whatever method of planting is adopted, if the ground be at all moist, the plants will root without difficulty. It is the practice of some growers to plant on ridges. In cold districts this is probably beneficial, but satisfactory results have been obtained without this trouble and expense.

YELLOW STRASSBURG

NANCY HALL

The subsequent cultivation given to this crop is such as will keep the weeds down and conserve moisture. Cultivation with a small-toothed scuffler may commence as soon as the plants are set out, and can be continued until the vines cover the ground.

Harvesting and Storing.

The mature stage can be determined by cutting one of the potatoes. If the cut surface dries white, and does not turn greenish-black round the edge, the potato is fit to eat. If a milky juice exudes which, on exposure to the air, turns black, the potato is not mature enough.

The potatoes will continue to grow until the first frost is experienced; this destroys the vines, and, of course, the tubers will cease to grow after this. The crop may be left in the ground until then, and if the frosts are not very severe they may be left until they are required, but the vines should be removed, or they will decay and communicate rot to the tubers.

During the last two months of the growing season the yield per acre is very much increased; in some cases it almost doubles itself. Where, therefore, bulk is desired it is well to leave the tubers in the ground for as long as possible after they become fit for the table.

The harvesting is usually done by hand labour. Some diggers prefer to use a pronged hoe, others a digging fork; it is a question of use. With some varieties which produce their roots in clusters around the "plant," the labour of digging may be lessened by throwing a furrow away from each side of the potatoes. When digging, care should be taken not to bruise the roots; a bruised potato rots easily, though a clean-cut one keeps well.

No difficulty has been experienced in storing small quantities of potatoes in dry sand. The tubers on being dug should be allowed to dry in the sun for a few hours, and then placed away in sand, where they will keep through the winter perfectly.

Varieties.

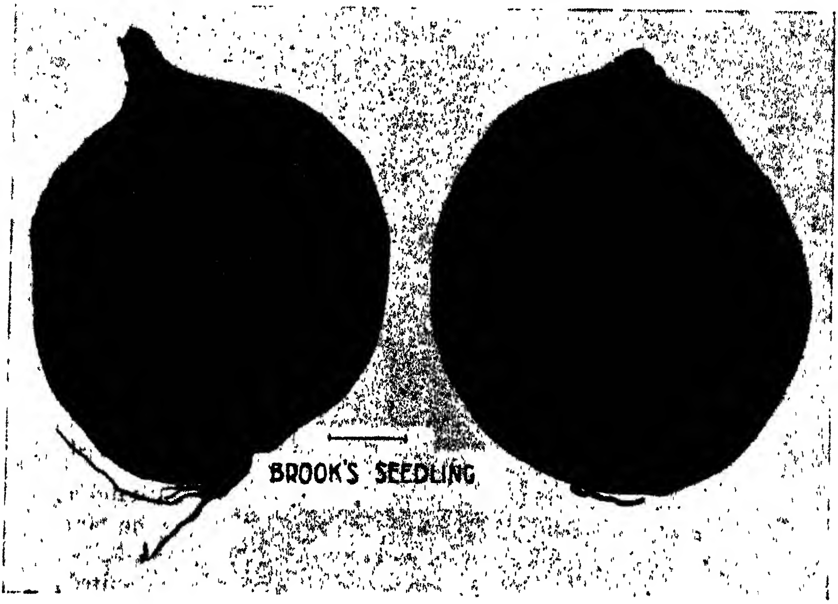
Two or three varieties have principally been grown in the past, and a few notes on these will be of interest.

White Maltese.—This is at present the variety most largely grown, having been a favourite for many years. The roots are white in colour and long in shape, and the cooking quality is fair.

Pierson.—This is a variety of long standing, but it appears to be gradually receding in cultivation. Except for its tendency to crack, it is a desirable type, being of fairly good shape, with good cooking quality; an early variety.

Pink.—This is rather a coarse variety, and although used for culinary purposes, it cannot be considered a desirable type, containing as it does a large percentage of fibre. It is a heavy yielder, and is best suited for feed for stock.

Within recent years a number of varieties have been imported from the United States of America, and have given fairly satisfactory results in tests


BROOK'S SEEDLING


SOUTHERN QUEEN

at Grafton and Wollongbar Experiment Farms. The average yields of the best of these new varieties, ascertained over a period of four years at Grafton and three years at Wollongbar, are as follows:—

Variety.	Grafton. (4 years.)	Wollongbar. (3 years.)
	tons cwt.	tons cwt.
Southern Queen...	8 2	7 0
Yellow Strasburg	8 13	4 2
Porto Rico	6 6	5 0
Triumph	8 5	3 3
Nancy Hall	6 7	5 1

As a comparison in yield, it may be mentioned that at Wollongbar White Maltese averaged over the same period 5 tons 17 cwt. In other trials of one season only on farmers' experiment plots, yields of these imported varieties have compared very favourably with the better-known local types. Further trials on similar plots in other districts have been arranged for.

Yellow Strasburg.—This variety is classified in the United States as more suited for stock feed, but although here it has produced some large type tubers, it is considered a good table sort with keeping qualities. On rich soils it will probably grow rather large, and is therefore better suited to the poorer type sandy soils. It is round to oval in shape and veined.

Triumph.—The roots are medium long and of good cylindrical shape, with light yellow skin. It is a desirable culinary type, the flesh being somewhat drier than most other varieties in cultivation; fairly sweet, with light yellow flesh, and suitable for early marketing.

Southern Queen.—A white roundish variety of a uniform smooth character, mid-season and of good keeping quality. The flesh is of good texture, moist and sweet.

Porto Rico.—While not as heavy a yielder as many of the older varieties, this is a very desirable smooth type of root. The globular shape makes it an acceptable sort for marketing. It has a coloured skin, varying from rose pink to slightly golden colour, and flesh of orange-yellow. A very sweet eating sort, with good keeping qualities, and considered by some the best culinary variety.

Nancy Hall.—This is an early variety, producing medium size, fairly round roots, which are yellow to salmon in colour, but tinged with a dark orange-yellow flesh when baked. It is a good culinary sort, very sweet, with a good textured flesh. It keeps fairly well.

A number of other varieties, including several from Queensland, have recently been secured by the Department, but the trials have only extended over one season. Some of the varieties are promising, but further trials are necessary before anything can be said about them with confidence.

Trials at Grafton Experiment Farm, 1924-25.

G. NICHOLSON, Experimentalist.

The variety trials which were carried out at this farm with sweet potatoes last season were situated on light and greyish-coloured sandy loam, which had previously carried a crop of peanuts. The land was disc-ploughed in July, disc-harrowed in August, reploughed and harrowed early in October, and springtoothed just prior to planting. The land was in good condition, and well supplied with moisture. It was single-horse cultivated between

PORTO RICO

rows on 2nd and 31st December and 8th January. As far as practicable (in view of a shortage of cuttings), one row 2¾ chains long of each variety was planted. The rows were 6 feet apart, and the cuttings 2 feet 3 inches apart, the wide spacing being resorted to in order to prevent any possibility of the cuttings becoming mixed. Two plantings were made—on 3rd and 22nd November. On both occasions good rains fell before and after planting out, and 100 per cent. stand was obtained. The following varieties were under trial:—Director, Bon Accord, Boyne River, Brook's Gem, Yellow Strasburg, Vitamine, Farmers' Special, Southern Queen, Brook's Seedling, Georgia, Red Bermuda, White Yam, Mammoth Cattle, Nancy Hall, Triumph, and Porto Rico.

The rainfall throughout the growing season was ample to meet all requirements the registrations being:—November, 360 points; December, 236; January, 602; February, 335; March, 634; total, 2,167.

The cuttings grew quickly, soon covering the ground, and the trial was remarkably free from weeds. The top growth was very heavy, although the roots did not develop as well as might have been expected. This was due, no doubt, to seasonal conditions and the fact that the varieties had too much room to spread. All varieties were harvested on 2nd April.

The following table shows the approximate yields of roots per acre:—

Variety.	Approximate yield per acre. t.	ct.	qr.	lb.	Variety.	Approximate yield per acre. t.	ct.	qr.	lb.
Mammoth Cattle ...	12	18	0	21	Boyne River	7	5	3	12
Director ...	10	8	0	18	Vitamine ..	7	5	1	17
Yellow Strasburg ..	9	18	1	3	Brook's Gem ..	6	19	1	19
Nancy Hall	9	7	3	0	Farmer's Special...	6	16	0	18
Red Bermuda	9	3	3	24	Bon Accord	6	5	1	12
Brook's Seedling ...	8	2	1	7	Georgia	5	14	3	5
Southern Queen	8	1	1	23	Porto Rico	5	4	0	5
White Yam	7	7	1	8	Triumph	4	0	2	13

The tubers were spread out in thin layers on the floor of a well-ventilated maize barn, and allowed to remain in that condition until early in August, when all good tubers were bagged and removed to another well-ventilated store. While in the maize barn all except four varieties kept well, but when stored in bags rot set in very quickly. Observations were also taken to ascertain which rotted badly in the seed-bed. At date of writing it is rather early to state definitely which keep best in the seed-bed, but general impressions have been formed.

Notes on the Varieties.

The following observations regarding the varieties tried were recorded at this farm this season:—

Mammoth Cattle.—Excellent foliage, vigorous runner; roots yellow, corrugated, globular, medium size, yellow-fleshed. Kept well in barn and fair in bags. Germination in seed-bed vigorous.

Director.—Heavy top growth, semi-bushy habit; roots white, produced in clumps; bulbous to elongated; white flesh. Kept well in barn. Germination in seed-bed fair.

Yellow Strasburg.—Good foliage, vigorous runner; roots yellow and globular and somewhat scattered, intermediate size, yellow fleshed. Kept well in barn and fair in bags. Germination in seed-bed vigorous.

Nancy Hall.—Good foliage, procumbent habit; roots white, bulbous, medium size, yellow-fleshed. Kept well in barn and fair in bags. Germination in seed-bed vigorous.

Red Bermuda.—Excellent foliage, vigorous runner; roots red, deeply corrugated, largest of all, produced in clumps. Very poor keeping qualities Rotted badly in field and barn. Germination to date nil.

Brook's Seedling.—Excellent foliage, procumbent habit; roots yellow and chubby, fair size, somewhat scattered, yellow-fleshed. Very similar to Southern Queen. Appears to be mixed. Kept well in barn and fair in bags. Germination in seed-bed vigorous.

Southern Queen.—Excellent foliage, vigorous runner; roots yellow, corrugated surface, chubby, fair size and yellow-fleshed. Kept medium well in barn. Germination to date good.

White Yam.—Excellent foliage, good runner; roots white, small to medium size, globular, even, and of good shape. Kept well in barn. Germination in seed-bed fair.

Boyne River.—Excellent foliage, semi-bushy habit; roots white, long and irregular, white-fleshed, produced in clumps. Kept medium well in barn Germination to date fair.

Vitamine.—Good foliage, bushy habit of top-growth; roots white, of medium size and length, white-fleshed. Kept well in barn. Germination to date nil.

Brook's Gem.—Good foliage, very distinct leaf, bushy habit; roots yellowish-white, chubby to long, produced in clumps, white flesh. Kept well in barn. Germination in seed-bed fair.

Farmers' Special.—Medium-heavy, procumbent top growth; roots yellow, medium size, chubby to long, produced in clumps, white-fleshed. Kept well in barn. Germination in seed-bed fair.

Bon Accord.—Medium-heavy procumbent top growth; roots produced in clumps; red skin, medium size. Very poor keeper. Germination good shot in store).

Georgia.—Good foliage, procumbent habit; roots yellow, globular to medium-long, yellow-fleshed. Poor keeping qualities. Rotted quickly in barn. Germination to date nil.

Porto Rico.—Excellent foliage, vigorous runner; roots very distinctive, swede-shaped, salmon-coloured, medium size, yellow-fleshed, produced in clumps. Kept medium well in barn. Germination to date fair.

Triumph.—Good foliage, semi-procumbent habit; roots yellow, elongated, small and yellow-fleshed. Rotted badly in field and barn. Germination to date poor.

In Favour of Baby Beef.

The trend in modern beef production is toward baby beef. A recent report of the Agricultural Experiment Station of the University of Minnesota points out that feeding baby beef has at least four advantages over feeding heavy cattle.

1. It has been found that calves and yearlings will make from 25 to 50 per cent. more meat from the grain consumed than the same animals would make if kept until two or three years old.

2. The turnover on the money invested in breeding cattle is much quicker when baby beeves are produced than when the calves are kept two or three years of age.

3. The number of breeding cows kept can be increased if calves and yearlings are sold, as there will be no two and three year old cattle to carry.

4. Open heifers often sell at a discount when more than two years old. Finished off as yearlings at 800 or 900 lb., they will sell almost as well as steers.

Broom Millet.

Prohibition of Importation from Other Countries.

It was in 1920 that the Field Branch of the Department of Agriculture first drew attention to the danger of the introduction into this country (per medium of broom millet from Southern Europe) of the European corn borer, a very serious pest of maize, broom millet, and a wide variety of other crops. The pest was years ago introduced into the United States of America in broom millet imported from Austria and Italy, and a large annual expenditure of money has been found necessary in keeping the insect under control. Broom millet has been regularly imported into Australia in comparatively large quantities from Italy by local broom manufacturers, but the danger of the corn borer being introduced in that way was not considered great until the New South Wales Department pointed it out. The representations to the Federal authorities have been renewed from time to time, but the reality of the danger was illustrated in 1924, when a shipment of broom millet from Italy was found to contain a 90 per cent. infestation of the European corn borer. The Director General of Public Health at once decided to enforce total prohibition of importation, and a proclamation was issued recently to that effect.

Onus on the Growers.

Despite the plaints of some manufacturers that it is necessary to import Italian millet because they cannot in some years obtain sufficient good quality material locally, the fact remains that during the war years, when importation was out of the question, the local millet proved quite ample in quality and quantity for Australian requirements (and even for New Zealand in addition), and such a fillip was given to a local agricultural industry that New South Wales alone practically doubled its area under the crop.

Now that importation has been totally prohibited, the onus is on the broom millet growers of the country of proving that not only can they supply sufficient millet for local manufacturers' requirements, but also that they can grow millet of the quality desired. The Minister for Agriculture (the Hon. W. F. Dunn) urges that in return for the complete protection from outside cheap competition and from all threat of the dangerous corn borer the local grower has a clear public duty to perform.

An Exceptional Opportunity.

Although the Hunter River district is still the chief centre of millet production, other districts, such as Tamworth and Tumut, have been making headway in recent years, particularly in the production of good quality material. It is conceded that weather conditions about the harvesting or

curing periods have much to do with the production of good quality, and that unfavourable conditions (too much rain) occur more often in the coastal districts at these times, but on that very account any means which will lead to greater likelihood of the production of more material of good quality should be considered, particularly on the Hunter. It seems certain that a better distribution of the planting here, instead of one large sowing at one time on the farm, will mean more chance of at least getting favourable weather for some of the crop. Many growers in the Tamworth district could also improve their quality on the hill soils by not planting so thickly on these soils. Broom millet has rather exact requirements in the matter of spacing between the plants according to the fertility of the soil. If sown too thickly for the soil, poor spindly plants of unusable brush result, while on rich soils too thin a stand gives a very coarse, undesirable brush.

No agricultural industry in Australia now has such an unimpeded opportunity to make good as has the broom millet industry, and it is for the growers to show that they are equal to the occasion, and that it is realised that a public necessity must be met.

Experiments in the Pruning of Orange Trees.

Summarising the conclusions suggested by study of performance records of pruned and unpruned Washington Navel trees over a period of ten years, Mr. A. D. Shamel (in an article in the *California Citrograph*) expresses the belief that with healthy full-bearing Washington Navel orange trees little pruning is necessary or desirable. Any attempt to make up through pruning for the lack of fertilisation, irrigation, fumigation or other cultural care has been disastrous wherever tried in the writer's observation. Individual tree care, including the removal of objectionable branches, excessive dead wood, diseased or injured growth, undesirable limb sports and related work is essential to successful grove management. In the case of very old and decadent trees the systematic renewal of such trees by judicious pruning is considered advisable.

Severe pruning, including the removal of healthy fruit-bearing growth or shaping the tree should not be practised or allowed by the grower. The losses from radical pruning are not confined to the cost of the work and the loss of crops for the first crop after the pruning, but the reduced yields are likely to continue for many years. The heavily pruned trees are reduced in size proportionately to the severity of the pruning, with a corresponding reduction in bearing area and capacity for fruit production.

As a rule in the writer's observation there had been a greater loss in Navel orange orchards from over-pruning than damage from a lack of pruning. Excessive dead wood usually indicated improper cultural practices rather than the need of pruning.

In these experiments the average yield of ten pruned trees was 159·7 pounds as compared with 169·1 pounds from ten unpruned trees, or an average loss through pruning of 9·4 pounds.

The Storage of Maize.

Its Possibilities in New South Wales.

H. WENHOLZ, B.Sc. (Agr.), Special Agricultural Instructor.*

With business methods and economic questions which affect prices, such as the storage and marketing of farm products, playing an increasingly important part in the welfare of the farmer, in addition to the raising of better crops and stock, it is becoming more the function of a Department of Agriculture to seek also in these former matters, as well as in the latter, any means whereby the lot of the farmer can be improved.

The subject of this paper comes well under this heading, and its choice for delivery at this conference is justified, not only by its importance at the present time, but also by its wide interest. The successful storage of maize should appeal not only to the grower, but also to the wider circle of those who use this grain for feeding to stock. Maize is a grain which has a high feeding value for all classes of stock; its merit in this regard need not be stressed here, save to say that America consumes 30 bushels per head of population, while Australia uses 2 bushels. It is possible that if better methods of storage could be found the grazier, the pastoralist, the mixed farmer, the grower, the dairyman, the pig-raiser, the poultry-farmer, and the manufacturer in Australia would all use more maize, to their greater respective advantage. The indication of such methods is the purpose of this paper.

There are two essentials for the safe storage of maize grain in bulk:—

1. A sufficiently low moisture content to prevent heating or mould.
2. Reliable precautionary measures and effective treatment against insect pests in storage.

The general experience of the storage of maize in this State in the past has not been universally or even largely successful, due to insufficient observance of one or both of these essentials. Attention to these two cardinal points will ensure success in storing maize on either small or a large scale in bulk in any part of New South Wales (or, for that matter, Australia). The rice weevil (the so-called grain weevil) is the most destructive insect pest of maize. Only in the colder elevated districts of the State is maize practically free from this pest. On the North Coast, with its long humid summers and mild winters, weevil reaches the height of destructiveness, passing through eight or ten broods in the season. A single pair of weevils at the beginning of the season may increase to several thousand millions at the end of the season, and it is therefore not surprising that a significant loss from this insect alone takes place in that

* Paper read at the third annual State Conference of Agricultural Bureau, Hawkesbury Agricultural College, July, 1925.

part of the State, where little or no treatment is given. It is estimated that the loss on some individual farms on the far North Coast runs as high as 10 per cent., and of our normal State annual production of maize (approximately 4,000,000 bushels) it is reckoned that insect pests in storage (chiefly weevil) take toll of 100,000 bushels at least, valued at £20,000.

Fortunately, the weevil has a weak point in its armour. It is unable to carry on its nefarious active life of destruction in the absence of pure air. It can survive on a little, but if deprived altogether of oxygen, it ceases to become a menace. Maize can therefore be kept on a small scale by the individual farmer or stock-raiser in sealed air-tight tanks which have been exhausted of oxygen. There are three efficient means of doing this:—(1) ramming the tank completely full of maize before sealing (the vital process going on in the grain being apparently sufficient to exhaust the remaining oxygen and to fill the tank with carbonic acid gas given off by the grain); (2) lighting a candle in a nearly filled tank before sealing, which exhausts the pure air and fills the tank mainly with carbon dioxide; (3) fumigation of the maize in the tank with carbon bisulphide or carbon dioxide gas and sealing down quickly.

On the North Coast particularly, weevil infests the early maturing crops in the field very badly before harvest. The later-sown crops, which mature in winter, are freer from weevil, but develop the pest quickly on the advent of warmer weather in the spring. If the early crops are left until the grain is sufficiently dry to thresh and store in bulk, weevil has already taken too big a toll, and the only alternative is to kiln-dry portion of this early crop, so as to render it quickly of sufficiently low moisture content for safe storage. This would entail husking from the standing stalks at harvest or hand-husking later, which in the districts where combined husking and shelling machines are in use would hardly be favoured. Again, the price of maize about the time the early crops are harvested usually justifies quick sale. It is therefore in spring, when the late crops dry out sufficiently for safe storage of the grain, that this should be done by the coastal farmer. Sufficient maize should then be stored in tanks to tide him over through the summer until the early crops come in. This phase of maize storage on the North Coast, where great loss from weevil occurs under present methods, should commend itself to farmers. Such safe storage, which is almost entirely neglected here at present, would enable the maize-grower not only to avoid great loss but also to utilise maize more advantageously through stock, especially when the price is low.

Similar methods of storing maize must appeal to the wider field of those who use maize, particularly to the pastoralist and to the poultry-farmer. Maize bought in spring or early summer from any part of the State will be of the previous season's crop, and will most likely be sufficiently dry for safe storage. Apart from safe storage, one of the greatest mistakes buyers of maize make is in not insisting sufficiently on securing dry maize. It is bad business to pay for water by weight in buying maize. The buyer of maize can always protect himself further from weevil damage by securing

maize from districts such as the Northern Tableland and the South-western Slopes (Tumut and Gundagai), where little or no weevil occurs. A great extension of inter-bureau trade in this direction is possible.

Any doubt about the moisture content of the maize being sufficiently low for safe storage (it must be less than 14 per cent.) may be cleared by forwarding a 1-lb. sample in an air-tight tin or bottle to the Department of Agriculture, which will test the maize and advise on its safety for bulk storage, and give details of precautionary measures and effective treatment against insect pests. No more hesitation, doubt, or failure with the tank storage of maize on a comparatively small scale should now occur with the individual.

The success with storage of maize on a large scale in silos at Atherton, however, draws attention to its possibility in our own State. The first thing that is apparent is that the advisability of silo storage for maize must be determined largely by local considerations. With an export trade or with bulk handling (and consequent saving in cost of bags), grain silo systems may be considered links in a chain with the terminal silo or market, as with wheat in New South Wales, or with maize in South Africa. As export or bulk handling is not likely to be of general significance in the maize industry in Australia in the near future (if ever), some urgent local necessity must be present for the success of silo storage for maize in any district, as was the case on the Atherton Tableland.

In the previously-mentioned maize districts in New South Wales, where little or no weevil exists (Northern Tablelands and South-western Slopes), there are the best possibilities for the silo storage of maize.

The following are some of the advantages of silo storage of maize, which may be reckoned against the cost, and some of which apply only or more forcibly in these districts:—

1. Improved facilities for financing the farmer. These are more urgent in districts where the sale of maize constitutes one of the most important sources of revenue from farming, or where the other main source of revenue, such as hay, is not shortly periodical, as are the returns from dairyng in coastal districts. Negotiable warrants on the delivery of maize to the silo would offer these improved financial facilities.

2. An assured market rise, sufficient to pay for the cost of storage. Maize stored in spring usually makes sufficient rise in summer or autumn to pay for this cost.

3. Prompt delivery from the silo, which means a better price by 1d. to 2d. per bushel than uncertain delivery from the farm.

4. Prompt despatch from the silo would also enable the holder to take advantage of a sudden small market rise, which he could not otherwise hope to do.

5. Better price of silo maize by reason of a standard grade or quality on which distant buyers could rely.

6. Direct delivery from the above districts to dry western sheep districts, saving freight to and from Sydney, which means a better price to the holder of silo maize and also a cheaper price to the pastoralist.

7. Improved facilities for pooling, if desired.

8. Less dissatisfaction concerning the weights of maize sold on consignment, if the silos are handled by the Government.

9. Slight possible saving in cost of bags, due to difference in price at time of storing in silo and sale from silo.

10. Improvement in standard of farming in the district by silo receiving only maize of good quality, or by the grading of maize at the silo.

Conclusion.

It remains for each maize-growing centre in districts such as Tenterfield, Glen Innes, Armidale, Inverell, Gundagai, and Tumut to consider these advantages with other local considerations, to determine whether the silo storage of maize will be a means of improving the lot of the farmer. If the conclusion is faithfully reached that the move is a desirable one, the Department of Agriculture may be relied upon to lend its earnest support, for its business is solely and simply to help the man on the land.

Strange Behaviour of a Queen Bee.

While examining a colony of bees in which a virgin queen had recently emerged from her cell, the virgin (then probably not more than twelve or fifteen hours old) was seen to behave in an extraordinary manner. Selecting a large burly drone as a victim for her blood-thirsty attack she sprang upon his back, with the agility of an Amazonian warrior, and, as if in a moment of impassionate rage, made several fruitless drives to deal a fatal blow through his hard chitinous thorax. Momentarily the assault failed. Vain, at this stage were the drone's efforts to dislodge the harassing intruder from his cumbersome body; but "right about" was the work of an instant for the queen, then a pause, as if to take steady aim, and (with lightning quickness) three deadly thrusts of her royal sword penetrated his neck. The great body of the drone quivered—his once powerful legs and wings trembled and straightened out, and he fell to the ground, dead.

Virgin queens, though full-blood relations, are naturally antagonistic and will kill one another when they come together in a hive. Unlike worker bees they do not lose their sting when it is used upon a rival.

Male bees are usually dispensed with at the close of the average honey gathering season (March to May) providing the colony has a fertile queen. They are driven from the hive by the workers and repelled when attempts are made to re-enter, until, through hunger, exhaustion, and cold they perish. Such is the inexorable law of nature in bee-hive economy, in which the incident related above has but an infrequent part.—H. Graham Smith, Apiarist, Hawkesbury Agricultural College.

Farmers' Experiment Plots.

SWEET SORGHUM TRIALS.

Lower North Coast, 1924-25.

J. M. PITT, H.D A., Senior Agricultural Instructor.

TRIALS with the above crop were conducted throughout the district during the late summer months. Those conducting plots were :—

W. H. Scobie, Oakhampton, Hunter River.
S. Epherk, Gostwyck, Paterson.
D. Cameron, Mt. George, Manning River.
F. K. Ward, Bowraville, Nambucca River.
G. Crew, West Gresford (pure seed plot).

The weather conditions were good ; heavy rain fell during all the summer and autumn months. It is the custom nowadays to sow Saccaline and sorghums late for winter feed, but the sowings of most of the plots under review were rather too late had it been desired to reap the seed also. Probably the ideal time of sowing is from mid-December to mid-January.

Varieties.

Rather extensive sowings are made of sorghum on all the Lower North Coast rivers, with the exception perhaps of the Mackay, where farmers depend more on pastures, late maize, and field peas. Saccaline is the variety most universally sown, and very rarely are the out-of-date sorts, Planters' Friend and Amber Cane, encountered.

Macleay River.

Saccaline gives a large quantity of succulent food during the middle and late winter months, and whilst perhaps not a good milk producer (nor indeed are any of the sorghums), it is nevertheless a very desirable crop to have growing. Becoming available, as it does, when there is not much else about, Saccaline is not absolutely resistant to red stain or frost, but is a vast improvement on the older varieties. It is fine-stalked, very sweet, and a heavy producer as well.

Of the newer varieties tried, there are not many, with the possible exception of *White African*, likely to oust Saccaline from its popular position yet awhile. White African, which must be sown earlier than Saccaline, is undoubtedly a splendid variety; it is heavy, succulent, fine stalked, practically (after two year's experience) red-stain resistant, and withstands frost better than any other variety. In addition, it is sweet and a very heavy yielder. Farmers like it, and although not (with one exception) prominent on the yield table this is accounted for by faulty germination. Seed of the variety is as yet scarce, but there should be ample quantity available within the next two or three years.

Red Amber, an early variety, took rust and red-stain badly; stalk fine; only medium sweet ; not worth trying again.

Collier has a fine stalk ; tall-growing ; sweet variety ; showed slight traces of rust and stain. At Gresford, although slower than Sorghum No. 61 (which grew 6 feet in 6 weeks), it was superior to that variety ; worth trying again.

Sorghum No. 34 has medium thick stalks, and went down in a wind storm ; very rusty and badly infected with red-stain. Yielded fairly well at Vacy.

Sorghum No. 61 is a fairly poor variety, a little earlier than Saccaline ; has fine stalks, sweet, and not badly infected with red-stain ; heavy yielder.

Gooseneck has moderately thin stalks ; fairly sweet ; subject to red-stain and rust ; rather late in habit.

Honey is a very heavy yielder with coarse stalks, not as sweet as others ; stands up well. At Oakhampton it was somewhat pithy, and was not taken to by stock ; slightly affected by rust and stain.

Sumac, a fine stalked sweet variety, standing up well ; juicy and fairly clean.

Orange, a fine-stalked, moderately early variety ; leafy and juicy ; sweet ; took rust and stain.

Bolong has medium fine sweet stalk, but very hard and not very juicy. Free from rust and stain ; stands up well ; did not germinate well. Readily eaten by stock. Frosted.

Darso, an early short-growing variety with stout stalk ; sweet, and not showing much stain. Not worth growing.

RESULTS of Variety Trials.

Varieties.	Oakhampton			Bowraville			Vacy.		
	t.	c.	q.	t.	c.	q.	t.	c.	q.
Early Red Amber ...	14	14	2	10	1	0	......		
White African ...	15	18	1	10	11	0	31	9	2
Collier ...	15	16	1	15	16	1	23	5	2
Sorghum No. 34. ...	16	17	3	16	17	0	22	19	2
Sorghum No. 61. ...	15	6	1	10	1	0	28	17	2
Gooseneck ...	13	9	0	11	6	1	19	14	3
Honey ...	22	0	0	17	13	2	22	17	0
Sumac ...	16	15	0	11	1	2	11	1	2
Orange ...	15	8	1	11	15	1	11	18	2
Darso ...	8	9	0	11	13	0	13	8	0
Bolong ...	Not weighed.			12	0	2	17	19	2
Saccaline ...	Poor germination			20	19	2	27	19	3
Local Saccaline ...	20	0	0	20	5	1	......		

Notes on the Plots.

Bowraville.—Soil, sandy loam ; previous crop, winter fodders. A dry spell checked the growth in January and February. Gooseneck, Red Amber, and White African lost in weight through being broken off by storm. Sown 16th December in rows 2 feet 6 inches apart. The farmer here prefers White African and Saccaline.

Mt. George.—The plot here was sown late in February and did not make much growth. Too patchy to take yields.

Oakhampton.—Rich alluvial soil ; sown January in drills 2 feet apart, with superphosphate at rate of 3 cwt. per acre. No. 34, No. 61, and Gooseneck went down badly here. The farmer places them in the following order :— White African or Saccaline, Orange, and Sumac.

Vacy.—Sandy loamy soil ; sown 3rd February in rows 2 feet apart. Some poor fields were harvested. The farmer likes White African and Sorghum No. 61.

Gosford.—Medium heavy soil. No weights were taken, but they probably exceeded 20 tons to the acre on each plot. The farmer likes Collier in preference to No. 61. Sown 22nd December.

To Safeguard Farm Stock.

The methods by which infection of a farmer's stock may occur may be set down as follows :—

1. By the introduction of diseased stock on to a farm.
2. By the introduction of infectious material on the clothing, boots, &c., of stock attendants or other persons coming from infected farms.
3. By the introduction of contaminated matter by uncontrolled agencies, such as birds, dogs, &c.
4. By the contraction of disease by healthy animals while temporarily away from the farm.
5. By taking healthy stock on to an infected farm.

Under each of these headings, except perhaps the third, various duties devolve upon the stockowner. How he may co-operate with the Department for the protection of his stock, and why in given circumstances certain practices should be observed and others as punctiliously avoided, are interestingly discussed in Farmers' Bulletin No. 137, "Safeguarding Farm Stock from Disease." The publication is one which should be in the hands of every farmer. It is obtainable from the Government Printer, Sydney, or from the Department, for 10d., post free.

To Improve English Live-stock.

During the year the Live Stock Improvement Scheme continued to operate on the usual lines, and on the whole satisfactory progress was made. . . . The Live Stock Scheme comprises a great deal beyond interesting the farmer in the use of a good sire, and, as regards his cows, in the keeping of milk records—which are the two main principles of the scheme. To educate the farmer so that the selection of good animals for breeding becomes not only a capability but a habit; to make suitable feeding an intelligent custom instead of a tedious theory; to foster a willingness to incur initial expenditure for the sake of ultimately better returns; in short, to demonstrate all the correlated requirements of "grading up," and the commercial soundness of them; these are objects which must take several years to accomplish, but toward which the live stock scheme may fairly be said to the making good progress.—*Journal of the Ministry of Agriculture, London.*

Excessive Acid Flavour in Butter.

While a certain amount of acid in butter is advantageous, it has been repeatedly found that many "off flavours" become associated with pronounced or high acid in this important article of food, particularly after it has been stored for some time. The knowledge that this is the case creates suspicion in the minds of the grader regarding the keeping quality of any butter in which the acid is markedly apparent, especially when the butter in question is required to be kept for any length of time. Last season this condition was common and many butters were probably penalised on that account. As the new season is approaching, the time seems opportune to discuss the cause of and remedy for this particular flavour.

High acid in butter is not always caused by insufficiently neutralising the cream from which it is made. In a number of instances it has been noted that, although the acidity of cream has been reduced to what might be termed a low acidity, such as ·15 per cent., and churned at this figure, the grader's remarks have indicated the presence of pronounced acid flavour. Conditions such as that quoted may have been brought about by certain errors in manufacture, which have resulted in the retention of curdy matter in the butter in the form of buttermilk, due to the use of high-churning temperatures, or insufficient washing, or both.

While efficient pasteurisation destroys over 99·9 per cent. germ life in cream, the butter made from it often becomes reinfected during the subsequent processes of manufacture and may contain many organisms. When suitable food is available, together with favourable temperatures, these are quite likely to produce both acid and "off flavours" in the finished product. Lactic acid is formed by specific types of bacteria. Other forms of germ life produce acid other than lactic acid, together with products which have a detrimental effect on the flavour of butter, while further types, such as yeasts and moulds, flourish in the presence of acid. The food required by these organisms to carry on their life work is provided by the curdy matter in buttermilk. Consideration of these facts will make apparent the importance of manufacture in controlling the acid content as well as other actions of germ life in butter.

The following suggestions may be of help in the prevention of the flavour under discussion:—

1. Reduce cream acidity to not less than ·15 per cent.
2. Churn to a fine grain at a temperature not exceeding 48 deg. Fah.
3. Allow buttermilk to drain out thoroughly.
4. Use plenty of water to wash the butter and let the washings drain away thoroughly.
5. Wash down the inside of the churn and spray the butter well with more water.
6. Drain these further washings away completely.

—A. M. Brown, Senior Dairy Instructor.

No effort to widen the market for fruit can be effective unless it is backed by the production of an acceptable article. And many of our armers have still to learn that the surest way of selling a product is to please the eye. Send the consumer attractively packed, sound fruit and he will most assuredly "Eat More Fruit."—*Journal of the Department of Agriculture, South Africa.*

Zone System of Cream Supply.

F. WILKINSON, Senior Dairy Instructor.*

IN visiting the various butter factories, Dairy Branch officials are frequently impressed with the amount of cream received from neighbouring districts in which butter factories are known to be in operation. In some instances it has been noted that cream has been sent 100 miles or more from the home butter factory, and during the journey has probably passed the doors of quite a number of other butter factories before reaching its destination. On various occasions inquiries have been made as to the reason—why suppliers send their cream away from the home factory—and in nearly every case so inquired into the factory manager concerned will state that these suppliers are discontented with the grade or test results, or both. If the matter is taken further, and one gets into personal touch with the suppliers themselves, they will almost invariably state that they do not get a "square deal" at the home factory, that they are being "robbed" in weight, test, or grade, and in some cases, not only do they state that the weights, tests, and grades are wrong, but that the error is made deliberately by the factory.

It is very difficult indeed to prove the correctness of these assertions, so freely indulged in, especially in regard to the matter of weight and test, for rarely indeed do we find either scales or testing apparatus on the farm. As for the grades, well, the supplier is naturally a biased individual in regard to his own cream, whereas the factory grader, whose aim is to place as much cream into choicest quality as possible without injuring the resultant butter, is a far more likely person to give an absolutely unbiassed opinion in regard to the grade of the cream. These graders, who are examined by the Dairy Branch, and receive scientific instruction in this regard, have positively no reason whatever to place a choicest cream into first or second grade, or *vice versa*. Whatever the grading of the cream, the result exhibits itself in the butter, and the Dairy Branch officials whose duty it is to examine the butter know very promptly whether the grading is being correctly carried out. So it is seen at once that incorrect grading, either on the generous or vicious side, speedily brings its own reward for the cream-grader concerned, in the grading of his butter, every grader of cream being compelled to grade correctly or incur the risk of having his certificate cancelled.

To return to the discontented supplier. Unfortunately, in some instances, he is not satisfied with sending the cream out of the district, but patrols the neighbourhood, sowing seeds of discontent, often stooping to untruths, in explaining to his fellow dairymen the treatment he imagines he received, in

*Paper read at the third annual conference of Northern District branches of the Agricultural Bureau, Tamworth, September, 1925.

the endeavour to induce others to forsake their own factory and send their cream to some particular factory or other, at which the discontented one loudly proclaims, he receives a "square deal."

Now, if zones or boundaries were agreed upon by the various factories for the collection of cream, and no factory would accept cream from another factory's zone, this class of discontented supplier would immediately cease to exist. He would either have to supply his own local factory or treat his own cream himself, or so improve his methods as to produce a genuine good quality article. Carried to a logical and legitimate conclusion, the inauguration of zones means an uplift in quality generally, thus greatly enhancing the permanency of Australian butter on the world's market. In addition, the class of farmer under discussion would be saved a deal of unnecessary expense by obviation of the extra transit charges involved in sending cream by rail, boat, or other conveyance away from his home factory. Mention may also be made of such other items of loss as lost cream cans, heavy depreciation by reason of rough treatment of the cans *en route*, farmers' time in getting to the station or wharf with his cream as against the placing of it on the roadside or at his dairy were he sending to the local factory. All these items, although of a minor nature when viewed from a "one-day" aspect, considerably increase when viewed in the aggregate, and were strict tally kept over a period of years the farmer would be astonished and dismayed at the loss which at the moment he lightly brushes aside. In fact, one is very much inclined to think that this particular class of dairy-farmer would have been in pocket at the end of the year had he supplied his local factory and received a slightly lower payment for the grade given his cream.

So much for the farmer. Let us now turn our attention to the factory. Unfortunately, in some instances, factories enter into competition with each other for suppliers of cream. Inducements are held out, such as higher prices for supplies. A factory with a large local trade can afford to do this, as the manager knows by the end of the month what he has sold the butter for, and with practically little or no freight and selling charges, he is in a far better position than the manager of the factory with a practically negligible local trade. This latter class of manager in many cases cannot possibly know what prices his butter will bring, especially in the flush summer months, until days or weeks after the date on which he has to pay for supplies. He does not even know whether the butter will be sold on the Sydney market or exported. If it has to be exported, he does not know at what rate of advance; in addition to this, he has to allow for heavy export charges, an item which a factory with a large local trade cannot appreciate. Then again, with export comes the rigid grading, and if by any chance the butter is placed in a lower grade than that expected, here again is another obstacle in the shape of a lower grade of advance. On the top of this comes the risk of falling prices in London while the butter is *en route*. These are the differences between a factory with a large local trade and a factory minus that very valuable asset. Certainly managers of the former class of factory are at

times inclined to hold out these inducements in order to build up their factory's connection, and by some this method may be termed fair competition—but is it ? Those managers who are blessed with a large local trade are inclined to take greater risks in the grading of cream (especially in regard to cream received from farmers who are sending away from their own local factory), whereas the other class of manager has to maintain strict grading in order that his butter shall open up true to label after possibly weeks in cold store and six to eight weeks on the water in transit to London. Compare the position of the two factories and then visualise the effect of the zone system in this regard, and one cannot escape the obvious equity of it were it in operation. On the one hand, strict grading is absolutely imperative if the suppliers are to receive the best prices overseas; on the other hand, doubtful creams can be put into choicest quality and sold at the factory door, and the manager is safe in the knowledge that the butter will in all probability escape the butter grader and go into consumption before its defects have time to manifest themselves.

There is another form of competition for suppliers, and that is the motor lorry. It is a daily occurrence in some districts to see a motor lorry owned by one factory running into another factory's district collecting cream. To secure the cream the farmer is told that it will cost him nothing for cartage. This may appear all right on the surface, but go a little deeper and inquire whether it is possible to run a motor lorry for nothing. If it were possible to effect this, then there would be substantial ground for making the assertion that the cartage will cost nothing; but running a lorry is a costly item, and the factory running the lorry has to meet the cost. It can only do so out of earnings, and earnings in a butter factory can only come out of butter, and butter can only come, in the first place, from the cow. Thus, although in a measure the statement that cartage will cost nothing may be true, boiled down it is untrue, for despite the fact that the factory may not make a direct charge to the farmer for the cartage service, the running of the lorry has to be charged to working expenses in exactly the same manner as wages or boxes, and so the farmer, although not paying the full cost of cartage of his cream, automatically contributes a "something" toward it by reason of the fact that the price he receives for his cream is determined by taking into account all costs, including the running of this particular lorry. This form of competition brings about overlapping, and this curse (for curse it is) in any industry spells *expense.*

Why factories should so compete for other factories' suppliers is very difficult to understand, for rarely do these renegade suppliers become shareholders in the factory they supply. Furthermore, it is found that these suppliers promptly transfer their affections to yet another factory should they at any time suffer what they consider to be an injustice from the factory of their adoption. Farmers should consider the full effect of such defections—consider the factory which is built and equipped to handle the whole cream supply of the district. What happens if it fails to receive full local support ?

A lot of money has been unnecessarily expended in providing for a something it does not receive. Take the opposite view—the factory which is suddenly inundated with cream from outside its own particular district. It cannot adequately cope with it, and on account of the great uncertainty as to how long these suppliers will be patronising the factory, the company does not feel disposed to permanently provide for the supply. What happens? While the additional supply does last the quality (which is any factory's best asset) is being sacrificed for quantity. Were the zone system in operation, this evil, with many other evils, would automatically vanish.

Advantages of the System.

There are many advantages to be gained by the zone system, and chief among such advantages are :—

1. A better quality butter produced generally all round.

2. A general uplift in cream quality by reason of the farmer, who was careless and supplying inferior cream, being unable to get his cream received at any factory other than his own. His own factory manager could then probably be of assistance to the farmer by visiting the dairy and removing the cause of such inferiority, while the fact that the manager was not compelled to gloss over defects in quality in order to keep the supplier would be of benefit to the industry as a whole.

3. Discontented suppliers would gradually disappear, and in their stead could, should, and would, I am convinced, arise that spirit of trust and coordination between supplier and manager and Dairy Branch officials so much to be desired and so vitally necessary for the general wellbeing of the dairying industry.

4. Cream quality generally would benefit by reason of the obviation of long haulage, thus enabling the delivery of a fresher and sounder cream to the local factory and consequent cheaper transit cost, together with a more thorough grading of the cream, which tends to produce a gilt-edged butter for the world's markets, a necessity which daily becomes more apparent. Quality simply must be maintained while New South Wales exports butter, otherwise we lose our market. Can the dairying industry in this State afford to jeopardise its overseas market? Certainly not. Then let every effort be put forth to maintain and keep it. Every year sees additional features demanded in regard to butter, and these demands must be met, otherwise the market is lost. The farmer himself has the position in his own hands either to maintain the present position or lose it. It is his own welfare which is at stake. Let him, therefore, take heed, avoid risks, and do the right thing.

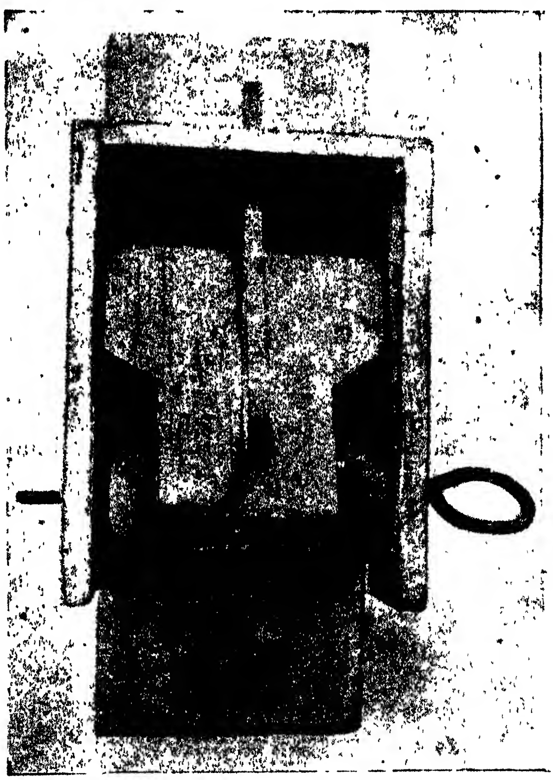
5. Factories could better provide facilities for the most economical and efficient handling of the cream, for the reason that the management would at all times be assured of the supply from a circumscribed area. It could approximate its supply, provide for its treatment, and rest assured that the

supply would surely reach its floors. Suppliers also would have the assurance that their cream would receive proper attention, and that the best results obtainable would be assured for them. Contrast this with the present situation, where factories are suddenly swamped with cream from unexpected sources. The factory deprived of its legitimate supply becomes expensive in its running, and the factory receiving this supply also becomes expensive in its running, for the reason that once an economic maximum is passed the running is equally as expensive as in an uneconomic minimum, and so from both aspects the costs are excessive, and the farmer pays.

6. Finally, contentment and harmonious relations as between the factory and suppliers are not only made possible by the zone system, but become concrete features of the industry—factors which stand for success and should not be lightly regarded.

A Wire Holder.

There are various ways of disposing of the spool of wire while wiring bee-hive frames, but surprisingly few of them seem to be quite satisfactory, and the spectacle of the wire winding itself in all directions to the inconvenience and annoyance of all concerned is common.

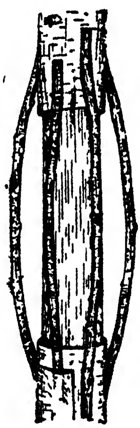


The contrivance shown herewith is quite easily made from a few bits of deal, a skewer, and a piece of thin steel for the spring. A rough box is made, through the sides of which the skewer is passed, the wire bobbin running free on the skewer between the sides. A small board, made so as to press on the bobbin, and held in place by the steel spring, completes the outfit, which can be hung on the wall in a convenient place. With the help of this holder the problem of where to put the bobbin while wiring is solved, and the wire is made available minus all objectionable kinks.—W. A. Goodacre, Senior Apiary Instructor.

Inarching as a Method of Restoring Injured Trees.

Mention was made on page 206 of the *Agricultural Gazette*, in March last, of the methods by which Mr. E. A. Neil, of Uralla, has saved a number of cherry trees in his orchard which were severely affected by gumming. A good deal of interest has been aroused by the references to Mr. Neil's methods, and, in response to a suggestion that illustrations would be of value, Mr. Neil has now supplied the photos from which the blocks on the next few pages have been processed.

As stated in the article referred to, Mr. Neil was confronted with the loss of trees that had hardly commenced bearing, and with the object of supplying the upper portion of the tree with a greater quantity of plant-food and moisture, he commenced by selecting a suitable sucker at the root and working it into a branch above the gummed area, on the same principle as grafting. In a little while a perfect union had been formed, and the branch, invigorated by the inflow of healthy sap direct from the root, picked up, and in a comparatively short time showed vigour and health. The method was so successful that it was applied to a number of trees, and always with satisfactory results. In one case there was no suitable sucker growing under the affected tree, and one was transplanted from elsewhere, and, after it had thoroughly established itself, it was inarched in the ordinary way.



Bridge Graft.
There are several methods of insetting the scions.
[*After Cardinell and Bradford.*]

The method is not altogether new, having been practised by growers in other lands for a good many years, but its application in this State is, at any rate, rare. Mr. Neil's method is known as "inarching," which consists of grafting a sucker from the root or even a scion from a new root system into the upper portion of the tree. Closely related to "inarching" is the method known as "bridging" or "bridge-grafting," which consists simply of bridging over the affected area by grafting wood into the tree below and above an injured or diseased area, as shown in the sketch on this page, taken from Special Bulletin No. 142, "Grafting in the Apple Orchard," issued by Michigan Agricultural College. The sketch referred to gives some idea of the different methods of working the scion wood. Note the curve of the scions in the case illustrated. This allows for the swaying of the tree, which is specially important in young trees. Bridge-grafting is a more difficult operation than inarching, and takes considerable time and labour, while inarching is comparatively easily performed. Both operations will be most successful, of

course, if performed when the bark on the tree slips well If attempted earlier, the raising of the bark is very difficult, and if it is accomplished at all much of the inner bark will remain attached to the wood

In the case of the illustration on page 815, serious damage had been done to the tree by a cultivating implement tearing a large wound in the bark. The success with which inarching was practised in this case was marked, the tree having been almost completely restored to its original value as a cropping unit

Fig. 1.—Inarching, as practised in the Orchard of Mr. E. A. Neill, Uralla.
The first inarch on this tree was made to bridge a dying patch on the small branch near the fork. The other inarches were made to enable sap to pass badly gummed patches, and the tree is now making healthy growth.

Fig. 2.—Inarching was adopted on this tree on account of dead patches, which can be seen on the branches.

Invigorated by the inflow of sap through healthy tissue, the tree is now in a much improved condition.

Fig. 3.—Another use for Inarching.

The bark on the main trunk of this tree was extensively damaged, probably by a swingle bar, and gumming followed. The tree is now healthy and profitable. The tall shoot seen in the front of the picture is to be worked into the upper portion of the tree this spring.

Fig. 4.—This tree was gumming very badly and dying back. Trunk now recovered and healthy. Four shoots growing from the ground level were inarched, and the tree was recently headed back for re-working The white patches are saw cuts covered with white lead paint.

Plant Breeding Possibilities.

J. T. PRIDHAM, H.D.A., Plant Breeder.

It is sometimes thought that artificial crossbreeding is the Alpha and Omega of the plant breeder's art, but the operation of cross-fertilisation is a mechanical one, though it is true that much judgment may be involved in the choice of parents. A good class of crossbred sheep may be raised by any careful farmer, but it requires a life-time of experience and sound judgment to produce the Corriedale. Similarly, the Darbalara Milking Shorthorn is the result of selection of individuals that conform to a given type—of culling those that fall short—which means a keen perception of distinguishing points.

In plant breeding, it is easy to pick out individuals which look better than their fellows, but to determine that they are so demands patient testing, and comparisons extending over a number of years.

That credit is due to the originator of Federation wheat is willingly conceded, but Sunrise oats, which, like Topsy, "just growed," is taken more as a matter of course as nothing to be surprised at. Bena wheat is in the same category; yet these are plant-breeding subjects, just as Federation or Marquis, though the transference of the pollen was done by nature instead of the hand of man.

Professor A. D. Shamel, of America, says: "The expert knowledge gained by constant study of plants under all conditions enables the breeder to select the best individuals without elaborate analyses, detail examination, or exact tests (score cards). The really important factor of all breeding is the development of expert judgment necessary for practical breeding and seed selection."

A farm boy may pick out a big head of wheat from his father's crop and grow the seed, multiplying it from year to year; but unless careful comparative tests are made no sound judgment can be formed as to the value of the crop. We may here cordially invite growers to send along any unknown and apparently promising ears for trial; they will be compared with our own best sorts. A request for information about the result will always bring an account of the behaviour and promise of the sample in reply. Professor Shamel goes on to say: "The increase of knowledge of breeding, due to the work of scientific investigators in this field, has enabled breeders to achieve results more quickly than heretofore. Notwithstanding these short cuts, the fact still remains that really valuable varieties have been developed and come into general use gradually and only after years of patient work. . . . . The work of the breeder becomes more valuable in proportion to the length of time spent in the improvement of the varieties."

Professor Bailey says: "Every decade sees a complete change in every variety of any annual species which is propagated exclusively from seeds, and every century must see a like change in the tree fruits."

Professor H. J. Webber remarks: "The change is not necessarily detrimental to the variety; indeed, the opposite is usually true. The almost universal unconscious selection usually results in gradual improvement, but along different lines. The changes wrought in the variety are so gradual, commonly, that we do not realise they are taking place unless the most rigid attention is given to keeping the variety pure. On the one hand, it is desirable to keep the variety pure, and on the other to detect promising variations which are retained for selection and improvement. . . . As the conditions are numberless, so the field for improvement seems almost inexhaustible. No branch of horticulture or agriculture promises more important and remunerative results than may be attained by intelligent plant breeding."

This is precisely what we find in this State. While new artificial crosses are made, the established varieties often exhibit new forms, some of which breed true while others continue to split up, requiring just as much attention and judgment as the varying progeny of artificial crossbreds.

A promising, if tedious and lengthy line of plant breeding, is the blending of disease resistance found in an elementary or unproductive type into an approved local variety. Both artificial crossings and fortuitous variations may be laid under contribution in this work.

The North Shore bridge will be an immense convenience in giving better transport and communication facilities, thereby effecting large savings in time and money. But if the same amount of capital were spent in wisely and rapidly developing plant-breeding projects, it is safe to say, in the light of results to date, that infinitely more wealth would result to the "man on the land" than is represented in the bridge undertaking, admirable as that may be.

Production of Cow's Milk with Antirachitic Properties.

CERTAIN French investigations in this relation (Lesne and Vagliano—*Comptes Rendus habdomadaires des seances de l'Académie de Science,* Vol. 179, No. 11) are the subject of notice in a recent issue of the *Scottish Journal of Agriculture.*

It is well known, says the journal, that the milk of certain animals lacks antirachitic properties, and the authors carried out experiments with a view to remedying this by modification of the cow's food, an extract of 500 gm. of cod-liver oil being added to the animal's daily ration. The food was well assimilated, and the general health of the cow improved, while the milk produced did not diminish in quality nor show any difference in smell, colour, or taste. The butter was of lighter colour, but was satisfactory in taste, and there was no difference in the quantity of butter-fat produced.

The results of investigations (including feeding experiments with rats) showed that milk from cows whose rations included a considerable quantity of cod-liver oil produced a quality of butter richly supplied with glycerophosphates (lecithin) and with growth-vitamins. Milk thus produced has both a curative and a preventive action on rachitis.

Field Experiments with Cotton.

NORTH-WESTERN DISTRICT.

C. McCAULEY, Agricultural Instructor.

THE following farmers co-operated with the Department in sowing cotton experiments during the season 1924–5 :—

J. C. Hobson, Gunnedah (variety trial).
G. Foote, Gunnedah (manurial trial).
W. A. Manning, Curlewis (pure seed plot).
A. Alexander, Yarrie Lake (spacing experiment).
S. R. Fallick, Culgoora (manurial trial).
J. Brake, Narrabri (pure seed plot).
Kook Bros., Inverell (manurial trial).
H. Mitchell, Delungra (pure seed plot).
W. G. Baker, Baan Baa (pure seed plot).

The plots at Gunnedah, Curlewis and Narrabri were destroyed by grasshoppers; the plot at Delungra was choked out by Bathurst burrs.

Culgoora.—This was new land; soil, sandy loam. Ploughed on 18th June re-ploughed on 10th September, springtooth-cultivated on 11th October The seed was sown on 11th October in rows 4 feet 6 inches apart. The rows were thinned out with a hoe during early December, and were cultivated in December and January. No further weed growth occurred, but the rows were cultivated again during February.

	Yield per acre.
No superphosphate	260 lb.
40 lb. superphosphate per acre	320 lb.
80 ,, ,, ...	190 lb.

The extra manure on the third plot caused extra good early growth, but it was the first to show the effects of the dry weather.

Yarrie Lake.—Previous crop, wheat, 1923; soil, belar country. The land was ploughed during the first week of March, skim-ploughed the first week of August, and cultivated the last week of August. The seed was sown in rows 4 feet 6 inches apart on 20th September. The spacing was done with a hoe early in December. The plots were cultivated twice during November and early in January.

	Yield per acre.
Seeds 6 inches apart	570 lb.
,, 12 ,, ...	510 lb.
,, 18 ,, ...	420 lb.
,, 24 ,, ...	450 lb.

Plots 3 and 4 matured at least ten days earlier than plots 1 and 2.

The Season.

The season was abnormally wet and cold during November and December, and very hot and dry afterwards. Early rains gave a good germination and a strong early growth, but owing to the dry autumn the plants generally were only about 2 feet high.

The rainfall during the growing period was as follows:—

	Culgoora.	Yarrie Lake.
October	46 points	94 points
November	532 ,,	540 ,,
December	69 ,,	70 ,,
January	97 ,,	94 ,,
February	60 ,,	30 ,,
March	32 ,,	31 ,,
April	10 ,,	5 ,,
Total	846	864 ,,

Summer Thinning or Training of Fruit Trees.

It has been noted that some orchardists refer to the work carried out in summer in connection with the training, or thinning, or partial thinning of their trees as "summer pruning." The Department does not recommend the use of this term for the work, as it implies the hard cutting back of the trees, which very often does a considerable amount of harm and little if any good.—W. J. Allen.

Bulk Wheat Wagons.

Many farmers who deliver their wheat to the country silos are using bulk wagons for the purpose of carting their grain from their farms to the railway station, and many more are considering the advisability of equipping themselves with this convenience.

Farmers are recommended by the Manager of the Grain Elevators to fit their table-top wagons with a grain-tight box, in the bottom of which should be cut three holes about 9 inches square, one over the king-pin, another a few inches in front of the back axle, and the third hole midway between these. Short sheet iron spouts should be fixed to the bottom of the box, extending through the table-top of the wagon, and fitted at their lower end with horizontal slides to control the flow of grain from the box. The centre opening will discharge directly over the grating in the receiving hoppers at the elevator, and chutes will be provided at the elevator to carry the grain from the two other openings to the central grating. The existing doors over the grating will be altered to permit the use of the chutes. Each carter should provide himself with a long handled scraper about 30 inches x 9 inches to scrape to the openings the small quantity of wheat which will not run out by gravity. It is not essential to have the bottom of the box hoppered towards the opening. The maximum weight of bulk wheat wagons loaded must not exceed 11½ tons.

Any farmer who intends to equip himself with such a wagon, and who is in doubt as to any part of its construction, is invited to communicate with the Manager of the Government Grain Elevators, No. 6 Jetty, Circular Quay, Sydney, stating his difficulty, and appropriate advice will be given.

Experiments with Plum and Prune Stock.

W. W. COOKE, Orchardist, Yanco Experiment Farm.

THE selection of the right stock on which to work fruit trees is of the utmost importance, as on the kind of root given to the tree often depends its further usefulness and the number of years it will continue to produce payable crops of fruit. The question of stock may be considered from two points of view. In the first, the selection remains in the hands of those raising the trees in the nursery, and it is or should be their aim to choose that which is known to give the best results with the variety being propagated, but there are occasions when it is desired to change the kind of fruit being produced on established trees, *e. g.*, to change from peaches to apricots or from apricots to plums. In this case the stock is already determined and it is only possible to select the variety to be worked on such trees.

As the requirements of the fruit markets are continually changing, the owner of a small block of, say, peaches, may find that his trees are not profitable, owing to the variety or distance from market, etc. He may consider that plums or prunes would pay him much better. If the trees are young he may hesitate to grub out the block, and would prefer to graft or bud them with the desired variety. Then arises the question whether the variety chosen will succeed on this particular stock.

To gain some information as to the chance of plums and prunes proving successful when worked on peach and apricot stock, and also to find out. if possible, what is the best stock on which to grow these fruits under irrigation, an experiment was commenced at Yanco Experiment Farm in 1917.

The following stocks were selected, and were planted in rows in the order mentioned :—Myrobalan, Marianna, apricot, peach. Later they were worked in rows running across, with Angelina Burdett and President plums, and with Clariac Mammoth (syn. with Robe.), Prune D'Agen, and Robe de Sergeant prunes.

The growth made by the plums on the different stocks varied considerably. Both Angelina and President made very vigorous growth on the peach and apricot, fairly strong growth on Myrobalan, and rather weak growth on Marianna. The order in which they commenced to bear fruit was as follows :—First on Marianna; second on Myrobalan ; third on peach; fourth on apricot.

Both varieties on Marianna soon began to produce heavy crops of fruit, the new growth made by the tree becoming weaker accordingly ; these trees were also inclined to bear on wood a year younger than on the other varieties. The tendency to over-production of fruit, in spite of heavy pruning, has resulted in the trees being of less size on this stock than on any of the others. (For table giving differences in height, spread, &c., see *Agricultural Gazette*

of June 1924, page 453.) Both varieties of plums on Myrobalan stock came early into bearing and are making fair growth, though not nearly so good as on peach and apricot. Though later in producing payable crops, those on peach and apricot are now bearing well, and the larger size of the trees gives them a decided advantage. Whether or not this will be maintained in the future cannot yet be stated definitely. In 1922 one row was re-worked with Standard prune and Grand Duke and Blue Imperatice plum. So far the growth made by all varieties is weak on Marianna, fairly strong on Myrobalan and strong on apricot and peach. Next season should give some idea as to how they will bear on the different stocks.

With the different varieties of prunes the growth is more uniform, though those on peach and apricot stock have made the strongest, then those on Myrobalan, with Marianna last. The trees worked on the latter stock, however, came into bearing first, those on apricot being last. Last year all produced good crops irrespective of variety or stock.

Although considerably more time is necessary before definite conclusions can be drawn, it would appear from the results so far obtained, that moderately young peach or apricot trees can be reworked with any of the varieties of prunes or plums abovementioned with reasonable hopes that they will bear remunerative crops of fruit. Also, that owing to the poor growth made by Angelina Burdett and President plums when worked on Marianna stock, and the tendency to over-produce fruit, this stock is not suitable for either variety on soil of such heavy nature as that here.

A Better Bull Campaign.

The Bull Scheme (of the Live Stock Improvement Scheme of the English Department of Agriculture) "is beginning to have a marked effect in the districts where it has operated for some time. The improvement effected in the quality of stock reared continues to be proved at markets and sales, and the introduction of special classes at shows for premium bulls and their progeny is an encouraging recognition of the scheme."—*Journal of the Ministry of Agriculture*, London.

Follow the Pioneers.

The drudgery so often associated with dairying represents, under present-day conditions, so much misspent energy and wasted man-power, and can be eliminated by the intelligent application of machinery to the more arduous tasks on the farm It is folly to rush haphazard at this thing and go machinery mad; but it is worse than folly for a farmer in this age to imagine that he can ignore modern labour-saving, and incidentally money-saving, methods and carry on in the same old way as his ancestors did before him. Remember, the pioneers had to adapt themselves to new methods in a new country, and we must recognise that we too must advance with the times, at the same time profiting by their experiences, their mistakes, and their discoveries.—Lindsay Evans, at the Agricultural Bureau State Conference.

Pruning Tests at Bathurst Experiment Farm.

W. J. ALLEN AND W. LE GAY BRERETON.

THE annual conference of officers of the Fruit Branch, and of the orchard inspectors of the Exports and Imports Branch, has been held at Bathurst Experiment Farm for the past seven years, and as some of the pruning tests conducted in the orchard during these meetings date back to the first held at Bathurst, and as in some cases definite conclusions have been arrived at, the following report has been prepared for publication.

Popular Varieties of Apples.

It has been observed that the best practice when pruning Granny Smith apples is to shorten the yearling laterals rather hard, leaving from 3 inches to 4 inches of growth (giving the more vigorous laterals rather more length than the lighter shoots), and the following season to shorten the yearling extension back to the cluster buds just above its junction with the two-year wood. Though in some cases the yearling laterals on the Granny Smith, if given greater length up to full length, will spur well towards the base, often they will only spur near the tip, leaving the part nearer the base bare or with only weak spurs. Of course, as in other varieties of apples, very short yearling shoots (about 3 inches long) tipped with a good spur are best left uncut. They will often crop and go on forming new spurs near the tip, which in these short shoots does not leave too much bare wood.

On the Rome Beauty apple, the method of stubbing back the yearling lateral hard to the cluster buds close to the base to form fruiting spurs has proved satisfactory at the orchard at Bathurst Experiment Farm. In other localities where the trees are making stronger growth, they will not settle down to short spur growth quite so soon, and under such conditions the operation must be repeated for three or four years (allowing subdivision of the lateral to go on without thinning out so that the sap will be divided between many growths) before the desired result is produced. A summer cut similar to the winter cut will hasten the result, but where woolly aphis is troublesome it is not advisable. It has been suggested that, after a good framework has been established, strong growing trees might be subjected to partial starvation by withholding cultivation during part of the summer with the object of hastening the development of short fruiting spurs in place of longer shoots.

The test demonstrated that yearling laterals of the Rome Beauty apples, carrying well-developed buds, would develop fruit spurs if given more length. Yearling laterals of this class occur more in some seasons than others, and more in some districts than others. This variation in type of yearling laterals occurs in all apple varieties that have been under observation.

It has long been known that if the yearling lateral of Jonathan apple is shortened hard, as described for Granny Smith above, the formation of fruit spurs is meagre, and if stubbed back similar to Rome Beauty the yearling shoot mostly dies out, because, as a rule, the cluster buds at the base of the lateral of the Jonathan are blind. It is also contended by some that the yearling lateral of the Jonathan would fail to form fruit spurs if shortened slightly, even if only the natural terminal bud was removed. The tests have shown that this latter contention is false, and that fruit spurs can be satisfactorily developed in a Jonathan tree, even if the yearling lateral is shortened slightly. In strong-growing young trees there is an advantage in leaving the yearling lateral untopped if the terminal buds are healthy, because often this terminal bud encloses blossom buds by which the early cropping of the tree can be increased. Moreover, it lessens the labour of pruning, though where apple mildew is prevalent many of the terminal buds are affected, and it is necessary then to remove them when pruning.

A type of yearling lateral, with small, poorly-developed eyes occurs in Jonathan variety, which when left long will not spur. The percentage of these on any tree is generally quite low, so that it is not necessary to give them special treatment, but where they are noticed thay can be shortened back to the lowest couple of lively eyes, when they will sometimes spur direct or throw a shoot with plump eyes that will spur. If removed altogether, very often a new shoot will not start to take the place, which will sometimes leave part of the branch too bare.

In strong-growing trees it is often advisable to allow vigorous laterals part of the extension of new wood the second year, as if cut back too soon after forming fruit spurs, many of the spurs will be forced into growth. Later, it is advisable to remove annual extensions, and if the spurs on the older laterals are declining it is often necessary to shorten back on to the older wood in order to preserve them or to provide for renewals.

Tests on Tasma apple are not complete, but as far as can be judged it is better to shorten the yearling lateral.

Some Pears.

In some districts Beurre Bosc pear will spur along the lateral when it is not topped, but in other districts this is exceptional, and most of the laterals will remain bare of spurs if the yearling laterals are not topped. Under the latter conditions it was shown that it is best to shorten the long yearling laterals back to the cluster buds near the base; this may require repeating for two or three seasons. Short laterals, especially stout ones up to 5 inches long, may be left untopped, for they often crop from the terminal bud and also develop a couple of fruit spurs behind the terminal, leaving only a small space of bare wood between them and the base of the lateral.

Packham's Triumph pear develops fruit spurs readily if the yearling lateral is left uncut or only shortened slightly. These long growths can be gradually reduced later. It is not advisable to stub the yearling lateral back hard, as sometimes only long shoots result and in other cases the stub dies out.

Josephine de Malines pear is often slow at coming into crop. The practice of leaving both leaders and laterals untopped after the lower portion of the framework has been established, and confining the pruning to thinning only, has proved the most satisfactory. After the tree has come into crop it can be headed back as desired.

Strong-growing young trees of Winter Nelis variety are very erratic in the direction of their leader growth, which makes them difficult to shape. At Bathurst it has been demonstrated that by refraining from thinning out the growth for a season or two, this erratic behaviour can be overcome to a great extent. It had been demonstrated previously at the Bathurst orchard that it is necessary to thin out the fruit spurs very severely or this variety will blossom heavily, but generally only set a light crop.

Prunes and Plums.

Robe de Sergeant prune forms fruit spurs readily, whether the yearling lateral is shortened or left long. It has been found advantageous to leave the light yearling laterals long on young vigorous trees of this variety. The increase in fruiting spurs is obtained more rapidly; moreover, there is less duplication of shoots, which is liable to make the tree too dense in foliage. Tests have shown that this variety, unlike many of the European type of plum, retains its fruit spurs well on the old wood. At the same time, some checking of the yearling extension of the laterals or shortening to spurs on the old wood is desirable or a tree will eventually overcrop and fruit become too small.

It is necessary in Prune d'Agen to have the yearling laterals long to obtain fruiting spurs. The following year the yearling extension must be removed, otherwise the spurs on the older part of the lateral will die out very rapidly. Provision must be made for renewals by cutting back rather hard on some of the older laterals, where spurs are becoming weak or disappearing.

President plum is now heavily produced, and it is necessary to keep the fruit of large size in order to obtain payable prices. Tests have shown that reducing the spurs and (as this variety crops on the yearling wood) shortening the yearling shoots back increases the size of the fruit, but does not obviate thinning of the fruit where very large fruit is required, because the variety crops in thick clusters. It is considered by some growers that this plum should be grown without opportunity of cross-pollination with other varieties, in order that it should set more lightly and thus obviate the necessity for thinning of the fruit. Some of the very thin yearling laterals of this variety die back when shortened.

Does Leaving the Leader Untopped Strengthen the Growth?

It has been fairly well established in the case of apples and pears that provided the terminal bud of the untopped leader does not blossom, the ensuing leader is stronger and the older wood below stoutens up more than if the leader is topped.

There is more uncertainty in this respect in reference to stone fruit trees. An endeavour was made to obtain some definite data on this matter, but it was found difficult to test fairly. For instance, on one occasion two weak leaders were left untopped, and the strong leaders topped on a young Robe de Sergeant prune tree. By the following season the untopped leaders has grown almost as strong as the topped strong leaders, but it was claimed by some that these untopped leaders, though smaller than the other leaders when they were topped, were sappy growths arising from the main stem below the original main arms of the tree.

Another test was then started on a young Robe de Sergeant tree as follows: Where two leaders had arisen from the previous topping of leaders, one was topped and the other left untopped, care being taken that in some cases the upper leader was topped and in others the lower leader. The relative size of the leaders was noted. Unfortunately during subsequent orchard operations some of these were pinched back during the growing period. However, a comparison could be made the following season where the pinching had not been done, and also where both leaders on the one limb had been pinched, and on the whole the leaders not topped in the winter had made the strongest growth. A weak leader left untopped had strenthened up considerably. However, the test was not unanimously considered conclusive.

Even in kinds or varieties of fruit trees, where leaving the leader untopped strengthens the growth, the method must be used with some caution, as often it allows too rapid an extension of limb, which, though perhaps it has grown thicker than if it had been topped, will still be too slender for its length.

Some young strong-growing Robe de Sergeant trees were left untopped at an earlier stage than is usual; others were topped, but given a longer length of leader than usual. In both cases the trees grew well and spurred up well along the leader, but the main limbs were rather slender for their length, which necessitated unusually heavy topping this season. So nothing was gained by leaving the extra length. This served to strengthen the views gained by many previous tests in an endeavour to avoid heavy topping during the early years of developing deciduous fruit trees. With few exceptions it has been found that some difficulty is met and that most satisfactory all-round results are attained by topping heavily till the lower part of the framework is established. This subject was fully dealt with in an article in the *Agricultural Gazette*, page 509, of the issue of July, 1923.

Return of Infectious Diseases Reported in September.

The following is the return of outbreaks of the more important infectious diseases reported during the month of September, 1925:—

Anthrax	Nil.
Pleuro-pneumonia contagiosa	2
Piroplasmosis (tick fever)...	Nil.
Swine Fever...	Nil.
Blackleg	1

—Max Henry, Chief Veterinary Surgeon.

A Disease Affecting Lucerne

There has recently been recorded for the first time in this State a disease of lucerne of considerable significance to the growers of that crop. The disease in question is known as stem nematode or eelworm disease, from the fact that the nematode *Tylenchus dipsaci* is responsible for the condition. Although in recent years the Department has been called upon to investigate a number of instances of failure in lucerne, and several fungi have been found commonly associated with the condition, this is the first instance in which the nematode in question has been found affecting the crop. The disease is known to occur in South Africa and in the United States, where it is now regarded as a most serious menace to lucerne.

The disease generally occurs in localised areas and is marked by poor stands with a reduced number of stems, some of which are yellow and distorted. Wilting is sometimes observed, and the stems, which are swollen at the base and brown in colour, become brittle and break easily. Plants may be killed outright. The new buds and sprouts are often swollen and pale yellowish or cream in colour. These new shoots do not move away in the spring and may remain in this arrested condition of growth for three to four months.

The only control measures are preventive ones. It is a most difficult disease to cope with, and eradication is suggested wherever possible. The organism may be starved out of the soil. This may involve the removal of lucerne from affected areas for three years. The removal of lucerne and susceptible weeds must be complete or the measure remains ineffective. Care must also be taken that the implements are cleaned and disinfected before use on clean lands.

Location of the disease in New South Wales started at the end of September on receipt of some infected lucerne plants from the Hunter River district. A visit to the locality revealed the presence of the disease on eight farms about Singleton, and the fact that it probably exists around Maitland and Raymond Terrace.

In some fields the stand has been materially reduced. The area most severely affected contained 80 per cent. of diseased plants. Several of the growers considered that they would be able to cut the affected areas once only this season. The opinion was expressed by growers that the disease has been present in some instances for a long period (up to eighteen years), although its nature was unknown. Indications are that it has been spread mainly by water, in some cases by cultivation methods, and in other cases by live stock.

It has been the practice to allow the most severely affected areas to "run out" and then replant to other crops. In some cases this has meant only three or four years of profitable cropping. When it is considered that lucerne may be grown for almost indefinite periods on suitable soils, this fact alone provides a very good index of the character of the disease.

A series of check observations on the causal organism are now in progress. —R. J. Noble, Principal Assistant Biologist.

One of the unanswerable arguments for diversified farming is the weather. It is rarely too wet or too dry throughout the whole of the growing season, nor is the rainfall and sunshine ever just right all summer. If the early crops are a partial failure, the late ones will usually be better, and *vice versa*. —*The American Fertiliser*.

Pure Seed.

GROWERS RECOMMENDED BY THE DEPARTMENT.

THE Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of various crops, in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

A grower's name is added to the list only (1) after the crop has been inspected during the growing period by a field officer and favourably reported upon, and (2) after a sample of the seed has been received by the Under Secretary and Director, Department of Agriculture, Sydney, and has satisfactorily passed a germination test.

Intending purchasers are advised to communicate direct with growers regarding the prices for the seeds mentioned hereunder.

***Maize*:—**

Fitzroy	R. W. Hindmarsh, "Wiaraga," Bellingen.
	Manager, Experiment Farm, Grafton.
	F. W. Hill, Willowvale, Yarramalong.
Ulmarra Whitecap	R. W. Hindmarsh, "Wiaraga," Bellingen.
Leaming	Manager, Experiment Farm, Grafton.
Golden Glow	J. F. Chick, Hill View, Tenterfield.

***Sweet Sorghums*:—**

Collier	Manager, Experiment Farm, Grafton.
Early Amber Cane	Manager, Experiment Farm, Bathurst.
Honey	Under-Secretary, Dept. of Agriculture, Sydney.
Saccaline	Alec. Smith, Bandon Grove, Dungog.
Selection, No. 34	Manager, Experiment Farm, Yanco.
Selection, No. 61	Manager, Experiment Farm, Grafton.

***Grain Sorghums*:—**

Manchu Kaoliang	Manager, Experiment Farm, Bathurst.

***Dual-purpose Sorghum*:—**

Darso	Manager, Experiment Farm, Glen Innes.

***Potatoes*:—**

Carman No. 1	Moreton McDonald, Crookwell.
Surprise	Moreton McDonald, Crookwell.

***Grasses*:—**

Hooker's Fescue	Manager, Experiment Farm, Glen Innes.

***Sudan Grass*—**

Sudan Grass	H. K. Nock, Nelungaloo.
	R. Wilson, North Logan, Billimari.

A number of crops were inspected and passed, but samples of the seed harvested have not been received, and these crops have not been listed.

SUMMER SCHOOL IN APICULTURE AT HAWKESBURY AGRICULTURAL COLLEGE.

THE Department has completed arrangements for holding the usual summer school in apiculture at Hawkesbury Agricultural College. The school will be run from 6th January to 22nd January, and will be open to applicants of either sex over sixteen years of age. A fee of £4 4s. (including board and lodging) will be charged for the course of instruction, which will cover all branches of practical work, and include a series of lectures dealing fully with the various aspects of bee-keeping.

Prospectus and application forms may be obtained from the Under Secretary and Director, Department of Agriculture, Sydney.

Poultry Notes.

November.

JAMES HADLINGTON, Poultry Expert.

Since the last issue of Poultry Notes, a conference of poultry-farmers has been called together by the Department. This action followed upon a promise made by the Minister for Agriculture (Mr. W. F. Dunn) at the Poultry Conference held at Hawkesbury Agricultural College last June. In order that readers of these notes who were not present may be acquainted with the principal issues that came under discussion, I propose to devote this month's space to a brief review of the proceedings.

In opening the conference the Minister expressed his desire to work in harmony and co-operation with all sections of primary producers, and the opinion that the poultry section ought to be able to work co-operatively better than many others, such as the wheat, wool, and fruit industries, whose members were scattered throughout the length and breadth of the State. He did not wish the proposed organisation to be a Government or departmental organisation, and he was not even anxious for representation on it. If they liked they might have a representative of the Department on such body as they might form. but the Department would work in conjunction with them just as readily without representation. All he asked was that they should keep in touch with the Department.

At the Hawkesbury Agricultural College conference a committee had been appointed to go into the question of marketing table poultry, and he understood that that committee had met at different times. He would ask Mr. Hadlington (chairman of the committee) to read to the conference a report that the committee had drawn up, and after that they could elect their own chairman and conduct their business in their own way. He would guarantee that the Department would give their decisions full weight, and if it could do anything to help them he would feel that something tangible had been achieved in their section of primary producers. The Department would be holding a grand conference. or a series of conferences, embracing all the primary industries, and theirs was the first section that had come together in conference since he had been Minister. He hoped their deliberations would be of value to them and the State generally, and to the Department.

The following extracts are taken from the report then submitted :—

" It will be remembered that at the last Poultry Conference held at the Hawkesbury Agricultural College, a committee was appointed to draw up a scheme for the handling and distribution of dressed poultry. The committee was composed of Messrs. A. Hughes, D. Sutton, J. Hadlington, H. F. Emert, Captain G. N. Mann, R. G. Christie, W. J. Buckland, W. H. Paine, E. Ward, and H. J. Tyldesley, and in its task it was confronted with two

fundamental considerations, namely, finance and facilities. In the absence of any organisation either to finance or put up adequate guarantees, the committee felt that it was futile to theorise and bring before you a nebulous kind of proposal. It therefore tackled finance first, and to this end a deputation from the committee waited upon the Minister, to ask what, if any, financial assistance he would be disposed to render in the event of something tangible being decided upon. In his reply to the deputation the Minister expressed his sympathy with the objective, and said that if a practicable scheme was submitted to him he would be prepared to consider giving assistance up to 50 per cent. of the value of the product. When considering the Minister's reply it was, of course, realised that only through some organisation could a scheme be put into operation. The other 50 per cent. had to be forthcoming either in money or kind, and adequate guarantees would be necessary to secure the assistance of the Government. The committee was in this matter up against its first hurdle.

Facilities.

"The next matter to receive consideration was that of facilities to enable such an organisation to operate on the sale, slaughter, dressing and distribution of poultry. Viewing the conditions under which these activities are at present carried on it was seen that there were some very serious obstacles in the way of any new organisation operating with a chance of success. It was recognised that the congestion of the present Municipal Poultry Sale Rooms was such as to preclude the proper handling of live poultry on sale days, and that such congestion was most inimical to the interests of the industry. Not only so, but looking to the future it was seen that very much more extensive premises would have to be provided. The provision for slaughter, dressing, and distribution of poultry were regarded as equally antiquated, and a change here also as highly desirable and as soon imperative. In short, the provision for both sale and slaughter of poultry in the city were regarded as totally inadequate to the growing needs of the industry. Having all these matters before it as preliminary to what is required, the committee felt that until some change was effected it was futile to draw up any concrete scheme such as desired by Conference.

"The committee then turned its attention to the question of removing some of the obstacles seen to be in the way of effecting their purpose. Mr. W. H. Paine was requested to explain a tentative scheme that was placed by him before the Metropolitan Meat Industry Board some three years ago in connection with the operations then about to be entered upon by the Coastal Farmers' Co-operative Society in connection with the handling of dressed poultry. The offer made to the Coastal Farmers' Co-operative Society amounted in brief to this: that the Board would find all facilities for slaughter and dressing for 1d. per bird. The outcome of this was that the committee passed a resolution instructing the Poultry Expert to interview the Minister, and ask if he was prepared to amend the Meat Industry Act to include poultry.

Following upon this I was instructed to wait upon the Metropolitan Meat Industry Board to place the matter fully before them, and ascertain their views on such a course. At that interview I placed before the Board the facts of the case, pointing out that whether or not it was favourable to this particular course the time had come for some better provision for carrying on these services, and it could not long be delayed. The Board discussed the matter with me very thoroughly, and there is no doubt but that it is impressed with the necessity for some such action. The members indicated, however, that before giving their view on the matter they would like to be sure of the fact that they had the whole-hearted co-operation of poultry-farmers in such a radical change. To this end a resolution will be placed before Conference to the effect that the Minister for Agriculture be urged to take the necessary steps to empower the Meat Industry Board to compulsorily control the slaughter of all poultry within the County of Cumberland. The committee does not contemplate the creation of a monopoly in favour of poultry-farmers or their organisations, but it does regard present conditions as wholly in favour of vested interests as against an open field for the widest activities, in which, if they choose, poultry-farmers' organisations could operate with equal chance of success."

Mr. W. H. Paine, Manager of the Animal Foods Department of the Meat Industry Board, then gave an explanation of what would be involved if poultry were brought under the Meat Act.

The following resolution was adopted :—

"That the committee appointed to consider the slaughter, dressing, storage and distribution of poultry, recommend to this Conference that it make representations to the Minister for Agriculture to secure such amendment of the Meat Industry Act or extension of the regulations under such Act, as to empower the Meat Industry Board to compulsorily control the slaughter, &c., at the Homebush Abattoirs of poultry within the County of Cumberland."

It was pointed out by Mr Dunn that the Meat Board functioned under the Chief Secretary, and any recommendation that they might make to him (the speaker) regarding the Act or regulations of the Act he would have to refer to the Chief Secretary. While at a conference recently in Melbourne, he had taken the opportunity of interviewing the Minister for Markets and the Federal authorities generally in regard to export—the export of fruit mainly—and the manner in which advances were made, and found that in no instance would the Export Control Board, or the Rural Credits Branch of the Commonwealth Bank, or any Board established by the Federal Government to make advances on any dried fruits, &c., make any advance to the individual farmer. The advances were made to the organisation he belonged to, and that was the only way in which they could be made. It meant in effect that if the fruitgrowers, for instance, of New South Wales wished to get an advance on their industry they must join the organisation representing that industry. He thought that was quite right, and that it was the only way in which they could possibly deal with a big subject like marketing at home and abroad. He would be willing to receive a deputation at any time they wished.

The Minister then vacated the chair in favour of Mr. Tyldesley, and conference settled down to consider a business paper containing some twenty-nine motions. Some of these were insignificant, and were either referred to the committee for consideration or disposed of on the voices. The really vital issues discussed were that already referred to, and the following, which were carried unanimously:—

"That in the opinion of this Conference it is necessary in the interests of the industry that poultry-farmers should be an organised body, and that an organisation to be called the Poultry Farmers' Association of New South Wales be now formed."

"That a compulsory egg pool be established in New South Wales by legislation similar to that in force in Queensland, whereby all eggs sold in the State of New South Wales be sold through pool floors."

"That all persons selling eggs be registered."

"That extensive canning be considered as a possible outlet for the annual glut of young stock."

Regarding the last of these four motions it was remarked that the proposal would become quite possible in the event of the motion being carried into effect.

A motion advocating the branding of cold stored eggs was overwhelmingly defeated.

Mr. W. H. Paine moved that the decision to form an Association be given effect to by electing a committee to draw up a constitution and bring the organisation into being. The following committee was elected:—Messrs. A. H. Tyldesley (President), A. Hughes, F. T. Turner, E. E. Goldsmith, H. P. Christie, A. W. Lewis, J. Paton, L. A. Ellis, and James Hadlington (Government representative).

Three meetings of the committee have already been held, and some considerable progress has been made.

A deputation has also waited upon the Minister to place before him the work of the conference, and ask that effect be given to the resolutions relating to control by the Meat Board, an egg pool, and registration of persons selling eggs.

The Best Dairy Breed

Some dairy farmers will spend years in discussing what is the best dairy breed and continue to milk scrub cows. I am frequently asked by farmers who are in this position what breed I prefer. I always answer "pure breds."

Three per cent. of the cattle in the United States are pure bred; 97 per cent. are grades, crossbreds, or scrubs. I will stand with any breed of the 3 per cent. as against the 97 per cent. The pure breeding of any dairy blood, developed for production, is superior to mixed blood if given the same care and opportunity: I mean this as no reflection on the thousands of high grades whose production has been built up by selection and the use of pure bred sires from high-producing dams. . . . Investigation in thirty-six States covering 25,000 head of breeding stock of all breeds, including pure breds, crossbreds, grades and scrubs, brings out the fact that based on utility alone, apart from breeding value or sale value, dairy cows of pure breeding have 48 per cent. greater earning power than others.—R. C. Barker, in the *Butter, Cheese, and Egg Journal.*

Orchard Notes.

NOVEMBER.

W. J. ALLEN and W. LE GAY BRERETON.

Cultivation.

IN some of our wetter districts it sometimes happens that showers of rain at frequent intervals impede cultivation so that the weeds get beyond the ordinary orchard cultivator, and it is necessary to resort to the plough to get the weeds down. The one-way disc orchard cultivator is a useful implement for carrying out this light ploughing between spring and Christmas on soil that has been ploughed fairly recently by heavier implements. In the drier inland districts showers are not usually so frequent, and weed growth can be satisfactorily kept under control by means of ordinary orchard cultivators.

It might be mentioned here that the plough makes a more lasting dry soil mulch than the cultivator, but it is generally not practicable to carry out all the summer cultivation with the plough.

The important point is that from spring on till the autumn every means should be employed to conserve soil moisture for the use of the trees.

Diseases and Pests.

Codlin Moth.—It is during November and December that the heavy emergence of moths from the carry-over grubs from the last season generally occurs in the tableland districts, and the spraying of apple and pear trees with lead arsenate will require constant attention.

Methods for destroying, as far as possible, the carry-over grubs (the sole source of the trouble for the ensuing year) were given in previous notes; the next step is to kill the offspring before they have damaged the fruit, or at any rate before the grubs change to moths and commence egg-laying.

In orchards where the pest has been allowed to obtain a good hold, spraying alone cannot be relied upon. The most effective method is to hand-pick the trees as soon as the first of the tiny grubs start to eat their way into the young fruit; this generally occurs during December in our tableland districts. As some of the carry-over grubs hang fire, the emergence is spread over a varying period, and this necessitates hand-picking more than once. This is, of course, an expensive job, but if done thoroughly and the pickings boiled up every night, the moth will cause very little worry towards the end of the season. We know of no method that will give quicker results in cleaning up a badly infested orchard.

Some infested fruit, of course, will escape even the most careful hand-picking, and bandages should be used for those grubs that eat their way

through and leave the fruit. These bandages should be examined once a week and the grubs killed, care being taken that no grubs are missed which fall to the ground when removing the bandage or which are attached to the bark instead of the bandage.

Black Spot of Apple and Pear.—Up to the time of writing the spring in most districts has not been favourable to this disease, but should a week or two of rainy or foggy weather ensue, it is liable to break out in those districts liable to spot, and growers should be prepared to continue the fungicide application later than the calyx stage if necessary. A leaflet on this disease is obtainable on application to the Under Secretary and Director.

Black Spot and Downy Mildew of Grape Vines.—It is during the blossoming period of grapes that special care is required to guard the vines from black spot, but, of course, if weather conditions should be favourable to the disease, spraying will have to be continued later. Apart from this, it is necessary to protect the vines from downy mildew, and Bordeaux mixture or some other copper sulphate spray should be used as a control for both.

Oidium.—Though this disease may be checked to some extent by the copper sulphate sprays applied for black spot and downy mildew, it is not wise to depend entirely on them, and dusting with flowers of sulphur should be resorted to if humid weather prevails.

Cherry and Pear Slug.—A lookout should be kept for this pest and the trees sprayed with arsenate of lead if it appears.

Woolly Aphis.—Tobacco wash or one of the commercial extracts of tobacco, such as nicotine sulphate, should be used on apple trees where this pest is making headway. Provided the tobacco wash contains nothing to upset the lead arsenate they may be combined. There is a disadvantage in this, however, because to be effective against woolly aphis a heavy drenching spray is required, which uses more material than is necessary when applying the cover sprays of lead arsenate; hence the combination is wasteful of lead arsenate.

White Louse of Citrus.—This pest will often appear on citrus trees within three or four months after fumigation, and if not dealt with, will soon spread to the twigs carrying the foliage, when fumigation will again be necessary.

To obviate this a careful watch should be kept on all citrus trees, and when the first new lice are seen on the main stem they should be sprayed with full strength lime-sulphur, taking care to avoid the spray getting on the fruit or foliage, which in the hot sun it will scald.

Summer Training and Disbudding.

During the spring and early summer it is advisable to make periodical inspections of young deciduous trees, and any strong growths that will not be required for the formation of the tree should be checked by being pinched

back to prevent them sapping the required leaders. Some such superfluous growths may be removed entirely to allow more light through the tree during the growing period, but this must be done with great caution. The inside superfluous leaders serve a good purpose in upright-growing varieties in helping to force the required leaders in more outward direction; moreover, if the tree is too drastically thinned during the growing period there is greater liability of loss of desirable leaders through heavy winds, and it must not be forgotten that the foliage elaborates the raw sap drawn from the soil by the roots, and any reduction in foliage cuts down the food supply of every part of the tree.

Trees that have been budded or grafted should be looked over, and growths from below the bud or graft either removed or checked to prevent them from sapping the growth of the scions. In trees that have been top-worked to some new variety, all the growth below the scions should not be removed, as it serves a useful purpose in shading the stumps till the tree has formed a new top, and also in the elaboration of sap, as mentioned in the case of young trees.

Thinning Fruit.

Some of the early peaches and apricots—such as Edward VII and Newcastle—are thinned where necessary during October, but most of the mid-season and late varieties of stone fruit are not ready for thinning till November and early December. It is wise to wait till the second shedding is complete, about when the stone is commencing to harden, for, if done earlier, the fruit may be left too sparse. This operation is most essential with varieties that have been heavily planted, such as President plum, for if the size of the fruit is not kept up there is difficulty in disposing of it.

Protecting the Farmer's Clip.

After rain, providing the sheep's fleece is dry, is the correct time to move them from one paddock to another, and if this opportunity is seized there will not be the same disastrous results as we often find where sheep have been kept on clean maiden land for perhaps eight or nine months in the year with a nice even bloom nourished by sufficient yolk to keep the tip healthy. This mellow tip, points out J. J. Mahood in a bulletin of the Western Australian Department of Agriculture, readily absorbs the slightest dust or foreign matter, and is seriously affected by driving along a dusty road for even a mile or two. Once this dust adheres to the greasy tip it remains there, and this often accounts for the difference in price of wool where one farmer purchases part of another grower's flock and drives it a few miles to his own property . . . It is the care of the sheep, preventing dust from getting into the fleece from the day they leave the shearing board until such time as they arrive to be shorn the next season, that makes the wool bright and lustrous, or dingy and shabby.

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 18th of the month previous to issue. Alterations of dates should be notified at once.

1925.

Society.	Secretary.	Date.
Lismore A. and I. Society	H. Pritchard	Nov. 17, 18, 19
Tweed River A. Society (Murwillumbah)	T. M. Kennedy	,, 25, 26
Orara River A. and H. Society (Coramba)	H. E. Hindmarsh	,, 25, 26
Quaker's Hill Agricultural Bureau	H. Trezise	Dec. 12

1926.

Society.	Secretary.	Date.
Albion Park A. and H. Association	H. R. Hobart	Jan. 1, 2
Dapto A. and H. Society	E. G. Coghlan	,, 15, 16
Northern Suburbs A. & H. Association (St. Ives)	T. Conway	,, 15, 16
Gosford A. Association	H. G. Parry	,, 22, 23
Kiama A. Society	G. A. Somerville	,, 26, 27
Wollongong A. H. and I. Association	W. J. Cochrane	,, 28, 29, 30
Yanco Irrigation Area A. Society (Leeton)	W. Roseworn	Feb. 9, 10
Mullumbimby A. Society	A. V. E. Overall	,, 10, 11
Tahmoor and Couridjah A. H. and I. Society	E. S. Key	,, 12, 13
Pambula A. H. and P. Society	L. K. Longhurst	,, 17, 18
Wyong A. Association	L. C. Reeves	,, 19, 20
Central Cumberland A. & H. Association (Castle Hill)	H. A. Best	,, 19, 20
Newcastle A. H. and I. Association	E. J. Dann	,, 23 to 27
Tenterfield P. and A. Association	....	,, 23, 24, 25
Alstonville A. Society	W. J. Dunnett	,, 24, 25
Gunning P. A. and I. Association	G. E. Ardill	,, 25, 26
Tingha	A. J. Dunshea	,, 26, 27
Blacktown A. Society	J. McMurtrie	,, 26, 27
Robertson A. and H. Society	J. F. Rofe	,, 26, 27
Tumut A. and P. Association	T. E. Wilkinson	Mar. 2, 3
Inverell P. and A. Association	....	,, 2, 3, 4
Bangalow A. and H. Association	....	,, 3, 4
Hunter River A. and H. Association (West Maitland)	M. A. Brown	,, 3, 4, 5, 6
Berrima A. H. and I. Society (Moss Vale)	W. Holt	,, 4, 5, 6
Nepean A. H. and I. Society (Penrith)	C. H. Fulton	,, 5, 6
Oberon A. and P. Association	....	,, 5, 6
Mudgee A. P. H. and I. Association	J. H. Shaw	,, 9, 10, 11
Yass P. and A. Association	E. A. Hickey	,, 10, 11
Ulmarra P. and A. Society	....	,, 10, 11
Cobargo A. P. and H. Society	T. Kennelly	,, 10, 11
Manning River A. and H. Association (Taree)	R. Plummer	,, 10, 11, 12
Cessnock A. Association	Bill Brown	,, 11, 12, 13
Campbelltown A. Society	W. N. Rudd	,, 12, 13
Batlow A. Society	C. S. Gregory	,, 16, 17
Cumnock P. A. and H. Association	K. J. Abernethy	,, 17
Gundagai P. and A. Society	M. W. Holman	,, 17, 18
Macleay A. H. and I. Association (Kempsey)	N. W. Cameron	,, 17, 18, 19
Rydal A. H. and P. Society	V. Bruce Prior	,, 19, 20
Royal Agricultural Society	G. C. Somerville	,, 29 to Ap. 7
Gloucester A. H. and P. Association	H. Watson	April 14, 15
Clarence P. and A. Society (Grafton)	L. C. Lawson	,, 21 to 24
Lower Clarence A. Society (Maclean)	T. B. Notley	,, 28, 29
Richmond River A. H. and P. Society (Casino)	....	May 5, 6, 7
Kyogle P. A. and H. Society	L. Campbell	,, 12, 13
Bonalbo A. and I. Society	W. G. E. Johnston	,, 27, 28
Murrumbidgee P. and A. Association	F. H. Croaker	Aug. 24, 25, 26
Ganmain A. and P. Association	C. C. Henderson	Sept. 14, 15

VOL. XXXVI. PART 12. DECEMBER 1, 1925.

Agricultural Gazette of New South Wales.

The Law of Diminishing Returns.

E. A. SOUTHEE, Principal, Hawkesbury Agricultural College.*

UNDER the existing conditions of our civilisation, one of the chief functions of the agriculturist is to provide food for the world. The problem of the world's food supply is one that has been much discussed since Malthus propounded the idea that population tends to increase in a geometrical ratio, while food supply increases in an arithmetical ratio. This drew attention to the fact that as population increases it becomes necessary to resort to less and less productive land, where, if improvements be not made in the methods of cultivation, it becomes more and more difficult to make a living. The extent of land is limited, and the extent of the more productive kinds more limited still; nor is the quantity of produce capable of being raised on any given piece of land infinite. This limited quantity of land and its limited productiveness are thus the real limits of production. By the application of additional capital and labour, the farmer attempts to increase the production of the land available, and it is his care to see that this is done with the largest possible return for his expenditure.

In ordinary business ventures the return secured from the application of fresh capital is usually subject to no retarding influences, always provided that stability of manufacturing costs is assured and that certainty of demand can be determined in advance. In the case of agriculture, however, the situation is vastly different, for we find that in whatever form it is sought to apply more than a certain amount of capital—be it additional manure, extra preparation of the soil, or anything else—there is a limit beyond which profits rapidly decline, or at least remain stationary. In theory there may be almost no limit to the yield of crops per acre, but Sir John Lawes long ago emphasised the fact that the cultivation of land, if profit were the objective, could very easily be overdone; that phenomenal yields achieved at enormous expense could not pay.

This idea was formulated by J. S. Mill in the "law of diminishing returns," thus: "After a certain, and not very advanced, stage in the progress of agriculture, it is the law of production from land that, in any given state of agricultural skill and knowledge, by increasing the labour the produce is not increased an equal degree; or to express the same thing in other words, every increase of produce is obtained by a more than proportional increase in the application of labour to the land."

This applies also to the application of capital, in any of its numerous forms. The application of this law might most readily be illustrated by the rough curve in Fig. 1, which shows hypothetical yields with the varying units

* Notes of an address before the Sydney University Agricultural Society, March. 1925

of capital—or labour—applied. The dotted vertical lines show the increase due to the addition of each successive unit. The curve becomes nearly horizontal after the application of the fifth unit of capital, while the increase due to the sixth additional unit is practically negligible. A concrete example —it might be called a classic illustration—demonstrating the incidence of

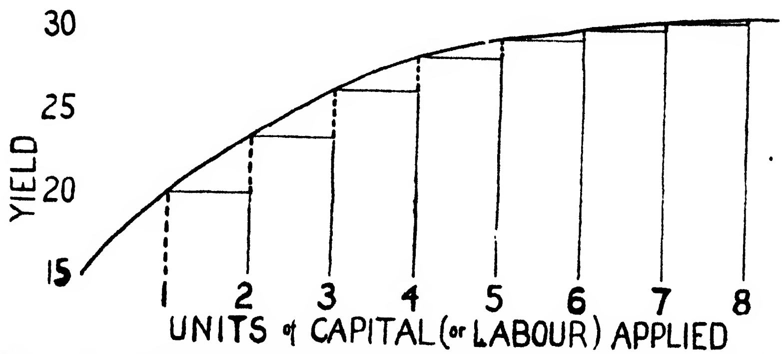


Fig. 1. Rough Curve showing hypothetical Yields with varying Units of Capital or Labour applied.

the law of diminishing returns is cited in the following table, which summarises the results obtained by Lawes and Gilbert in Rothamsted experiments extending over a period of thirteen years (1852–64). The table shows the returns from plots with no manure, compared with plots to which applications of manures containing respectively the equivalents of 43, 86, 129, and 172 lb. of nitrogen were added.

Plot.	Manures per acre.	Dressed Grain. Produce per acre.	Dressed Grain. Increase for each additional 43 lb N. in manure.	Straw. Produce per acre.	Straw. Increase for each additional 43 lb. N. in manure.
		bushels.	bushels.	cwt.	cwt.
5	Minerals alone	18·3	...	16·6	...
6	Minerals and 200 lb. nitrogen as Ammonium-salts.	28·6	10·3	27·1	10·5
7	Minerals and 400 lb. nitrogen as Ammonium-salts	37.1	8·5	38·1	11·0
8	Minerals and 600 lb. nitrogen as Ammonium-salts	39·0	1·9	42·7	4·6
16	Minerals and 800 lb. nitrogen as Ammonium-salts	39·5	0·5	46·6	3·9

The results are illustrated in Fig. 2, which also shows a comparison between the monetary returns from these plots when (1) low prices (grain at 3s. per bushel, straw at 20s. per ton), and (2) high prices (grain at 4s. per bushel, straw at 30s. per ton) rule. The straight line indicating cost of production is

based on a fixed figure of 80s. for cultivation and an additional 30s. for each 200 lb. ammonium salts applied. It will be seen that with lower prices the crop ceases to be profitable before the third addition of manure, while the second addition is the most profitable. With higher prices, although there is a profit with every application of manure, the third addition only returns 14s. and the fourth 8s. for an expenditure of 30s. in each case.

Sir John Lawes pointed out that intensive cultivation and liberal expenditure on manure are only justified in times of high prices, and are no remedy for low ones.

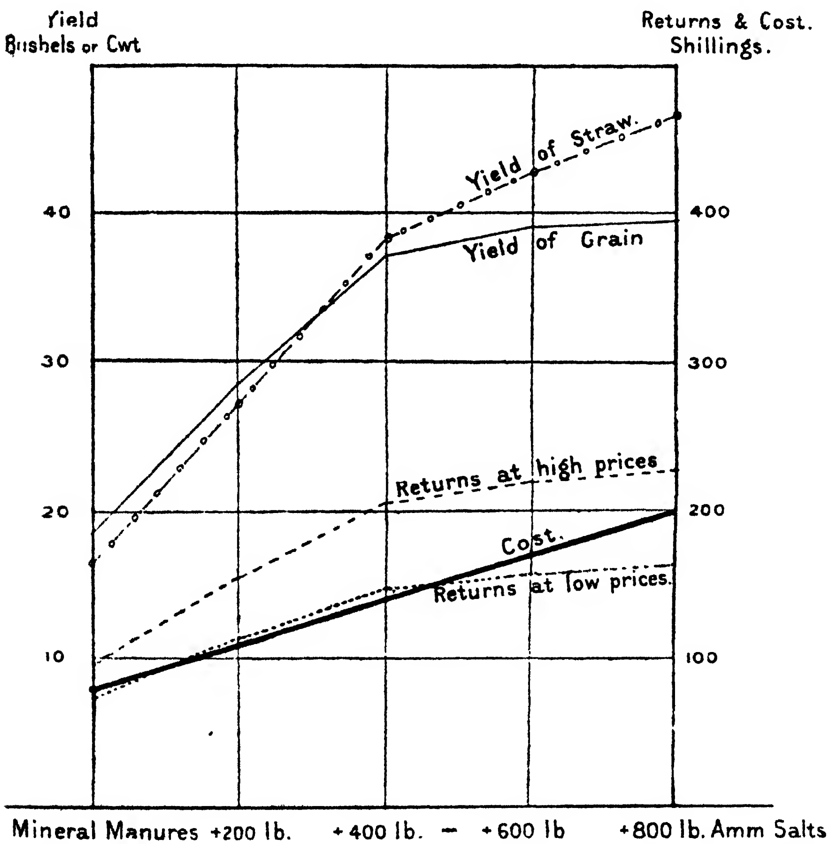


Fig. 2.—Relation between Cost of Production and Returns with varying quantities of Manure.
[*After A. D. Hall.*

The point at which the value of the increased return balances the outlay in procuring it, also the point of maximum and diminishing returns, wil vary within a wide range and be influenced by many factors—locality, nature of land, past history, ruling prices for agricultural products, and the

cost of labour and material. In old countries, where agriculture has been long established, ruling prices and cost of labour and material are probably the most important. As Sir John Lawes pointed out, "high farming is no remedy for low prices." In Great Britain in times of high prices of cereals land is farmed which in times of low prices is under grass. In new countries, such as Australia, operations are usually commenced on soil possessing full fertility. At first no application of manure is required, and capital outlay is confined to mechanical preparation of the land, for which little rent is paid. Then small applications of manures become necessary, and finally the problem becomes more difficult. Locality and nature of the land are here the chief factors.

The law applies to all phases of agriculture and farm practice in which labour and capital are utilised. The profitableness or otherwise of any practice will depend upon just this—whether the value of the increase due to that practice exceeds or is less than the cost incurred in bringing about that increase. The following examples are put forward to demonstrate the operation of the law and as a guide to farmers desirous of determining the most economical way of running their businesses.

Fertilisers.

The beneficial results of superphosphate gradually diminish throughout the western districts which form the central portion of the wheat belt, and in the north-west practically no advantage is gained by the use of this fertiliser. The determination of the most economical amount of fertiliser to be applied can only be made by experiment. The chart in Fig. 3, which summarises the results of trials on farmers' experiment plots for the years 1916 and 1917 in the Riverina and South-western Slopes, should therefore be of interest. The amount generally applied is 56 lb. per acre, but from the chart it is obvious that the most economical application varies greatly in different districts, the best quantity for each locality being that at which the vertical distance between the lines "Cost of Increase" and "Value of Increase" is greatest.

The effect of superphosphate in top-dressing experiments with lucerne (see *Agricultural Gazette*, January, 1923, pp. 37–38), is illustrated in Fig. 4. The yields were as follows:—No manure, 15·25 cwt.; 1 cwt. superphosphate per acre, 28·75 cwt. (13·5 cwt. increase over no manure); 2 cwt. superphosphate per acre, 37·25 cwt. (8·5 cwt. increase over 1 cwt. superphosphate).

Perhaps the best Australian illustrations can be obtained from the reports of the Werribee (Vic.) Research Farm, where accurate records of fertiliser trials on many different crops have been kept, extending over a number of years. It is important in comparing fertilisers to ensure that equivalent amounts of the elements of fertility are taken, and that varying amounts be applied. In evaluating "value less cost of increase," allowance should

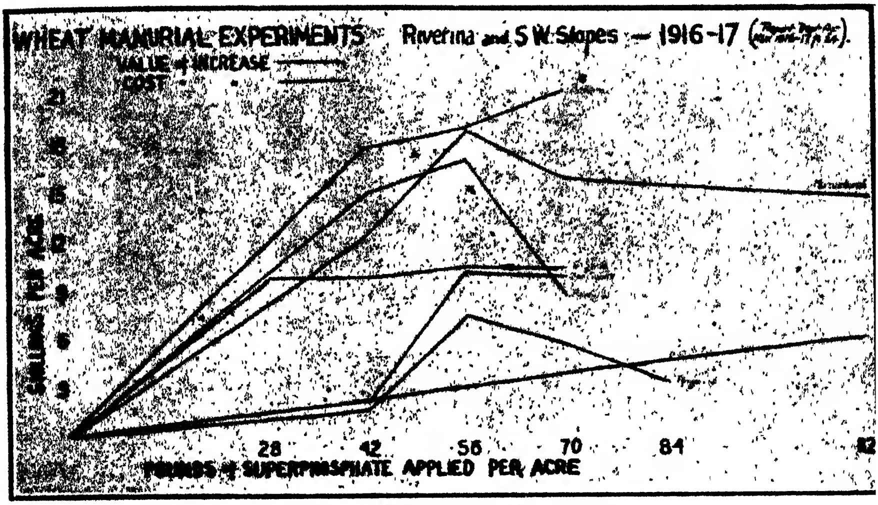


Fig. 3.—Wheat Manurial Experiments.

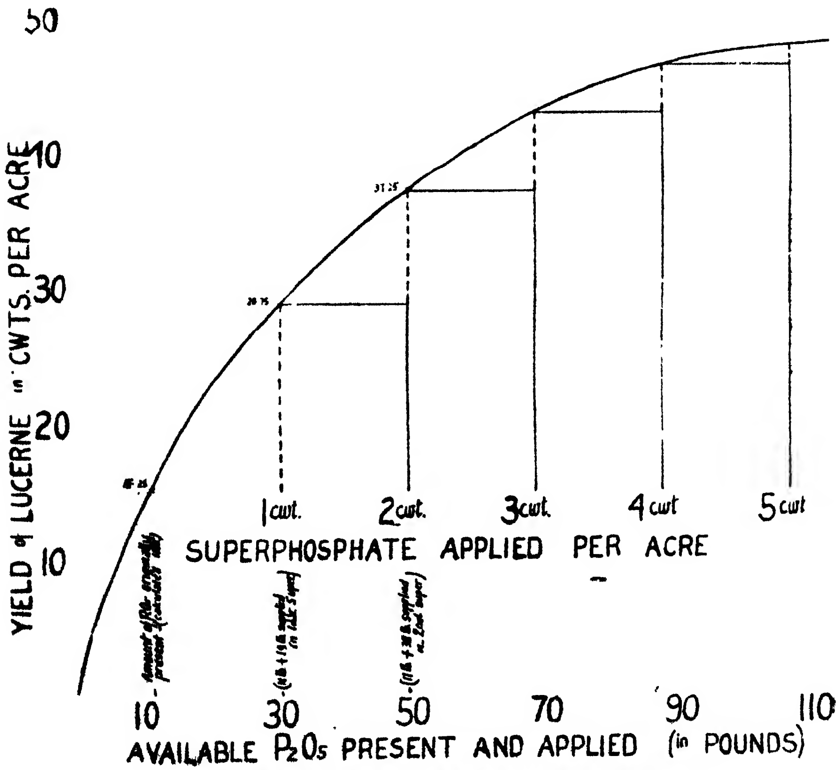


Fig. 4.—Effect of top-dressing Lucerne with Superphosphate.

be made, where necessary, for carting (man and horse charges), mixing and sowing fertiliser on the one hand, and extra harvesting costs, carting, &c., as well as other incidentals in connection with the increased crop*.

Farm Practices.

Copious illustrations of the principle of "value less cost of increase" are to be found in the reports of the Werribee Research Farm, and in the *Agricultural Gazette* of New South Wales. Certain maize experiments conducted at Grafton Experiment Farm (see *Agricultural Gazette*, page 710, 1922) demonstrate the method:—

(1) Winter ploughing gave an increase to the value of £3 19s. 9d. (at a cost of £1 4s.) over spring ploughing.

(2) Cultivation until tasselling showed an increase to the value of £1 7s. 6d., at a cost of 13s., as against only one cultivation after hilling.

(3) Compared with three grains every 40 inches, in a rate of seeding trial, three grains every 32 inches showed a net gain over cost of extra seed of £3 4s. 6d.; three grains every 20 inches a net gain of £4 14s. 6d., and three grains every 28 inches a net gain of £4 17s. 1d.

At Wollongbar Experiment Farm (see *Agricultural Gazette*, page 464, 1922), graded maize seed, at a cost of 1s. 5d., gave an increase valued at £2 7s. 3d.

Irrigation Practice.

Problems of water application are being investigated at Werribee Research Farm, and the results obtained (see *Journal of the Department of Agriculture*

* Attempts have been made to develop formulae for interpreting the results of soil treatment. Liebig's idea, that each additional unit of application will give an increase equal to that produced by the first unit of application, gave a straight line graph. His idea has been shown to be erroneous, and Mitzcherlich's "law of the minimum" seems to fill the bill more accurately. He maintained that the increase resulting from additional units of an element in the minimum bears a definite ratio to the decrease from the maximum, and he formulated the mathematical equation

$$\frac{dy}{dx} = (m - y)\,k,$$

where k is a constant, y the amount of crop corresponding to an application of x units, and m the maximum obtainable by addition of any amount of the fertiliser—giving a logarithmic curve to express that idea.

Murray, J. A., in *Soil Science*, 17, 359-371, 1924, makes use of the results of the lucerne top-dressing experiment referred to above to demonstrate the method of using the formula. M is found to be 51·78, k = 0·4614, x = 0·7556. From this it was estimated that the amount of available P_2O_5 originally in the soil was about 11 lb. per acre. With hay value at £3 10s. per ton and superphosphate at £7, the author stated that the quantity of superphosphate applied might have been as much as 5 cwt., giving a crop of 48 cwt. per acre. From the chart it is possible to read off the yield which should (theoretically) be obtained from any application of fertiliser, *e.g.*, to produce 1 ton of lucerne per acre an application of about 28 lb. of superphosphate would be required.

"for no two seasons' product is the same, but if the programme outlined in Mr. Tregenna's leaflet is followed it will always give a saleable leaf. The most critical stage is when the colour of the leaf is being fixed; then the control of the ventilation is most important."

"Tobacco-growing involves a good deal of risk," said one who had grown four crops on a highly suitable piece of ground; "I have had four seasons' experience now. The first year we had a nice crop on a small area. The next season was very dry, but we irrigated with very good results. Last season was a poor one, as we had a bad outbreak of mould. This year we have again had ordinary results. Next year should be a champion one to complete the cycle!"

It will be gathered that the crop is not one for a man without capital or resources. On the other hand, it requires constant attention, and the area which one man can cultivate is therefore quite limited. These rather narrow requirements have resulted in tobacco-growing becoming largely a matter of share-farming, the landlord often being a grazier whose property includes a few acres of river flat, but whose sheep-farming or dairying interests prevent him taking to cropping himself. The share-farmer, who must have a good reputation in the district as a reliable man, is generally pleased to get an opportunity to take up the cultivation of the crop, for with an average season and with a reasonable amount of care in the field and barn a product can be turned out that will represent quite a handsome sum.

The common mistake is for a man to attempt to work too large an area. Four acres furnish plenty of work during growth, for cultivation must be thorough and clean, and while implements are essential, hand hoeing is imperative and must be repeated. The same limitation as to area applies when harvesting and curing time arrives. The handling of an average crop will fully engage one man during the period between the maturity of the earliest portion of the crop and the curing of the latest portion, while "bulking down," stripping, grading, and baling will keep him going for some time after. Thus a 4-acre crop will keep a man fully engaged for seven or eight months, and as nearly twelve months elapse between the planting out and the sale of the cured crop to the manufacturer, he will have a period of four to five months in which he can earn wages or undertake small contracts elsewhere.

A Profitable Product.

The profits that attach to a fair year are so good that many a man is tempted to try a little more than 4 acres. "Surely by working a bit harder or a few hours extra he can handle six!" But it does not work out, and the man who attempts too much is generally less successful than the one who confines himself to a reasonable area. "A small area well attended will give better results than a larger one farmed in a slip-shod way," said one landlord, and his testimony had the decided support of a share-farmer in a subsequent conversation.

The bulking shed should be as commodious as possible, and should bo of material that will exclude atmospheric variations. To suggest that it should closely resemble the curing barn would at least indicate what is desirable.

How serious may be the damage done by mould in the bale or bulk was illustrated in ono case where a crop, which had been seen by Mr. Tregenna a few weeks before, and which then looked rather a good one, had become extensively mouldy and in places quite warm by the time the buyers saw it. What had brought about such a marked change can only be a matter of speculation, but that the leaf was unsuitable for manufacture was apparent. At the same time, tobacco is not without capacity for recovery even under such conditions, provided reasonable treatment is given, and the grower in this case was advised that a good deal of leaf could be reconditioned with advantage. It was suggested that he should open the bales at once, shake out the hands, transfer the whole of the leaf to the curing barn and air off and dry it by lighting the fires, after which the leaf might be bulked down again, regraded, and baled for further offer. That it would quite recover its original quality was improbable, but that a good deal would yet have an appreciable value was distinctly probable.

Of green leaf—one of the manufacturer's prime aversions—but little was seen, another evidence that the advice offered by the Department's Expert is being generally applied. A faint greenish tint in a few leaves is not altogether objectionable, for it will come out in the process of maturation, but a green colour that is the result of drying quickly in the early stages is a definite depreciation. Some nice-textured leaf had a good lemon-colour at the tips, but was a decided dark-green at the butt end. In this case, of course, the curing at first had been slow and good, but later on heat had been applied too quickly, and in the upper half the green colour had become fixed.

A Grower's Reflections.

The grower requires to realise that a light yellow colour is the natural result of proper curing of the well-grown, thoroughly matured leaf, but to get such a result the moisture must be driven off slowly. The harvesting of the leaves as they mature—known as "priming"—involves a lot of labour, but "I believe it pays, especially with the man who has had a little experience," said one grower who has successfully raised several crops. "A new grower should start with stalk-curing, and with care he will produce a saleable leaf the first season. He will see the ripe leaf colour up well, and will find the immature leaf is slower in changing colour. The next season he will be able to 'prime' with advantage, and should make money by it." An operation the rudiments of which can be learned in one season cannot be such a difficult one, and indeed that was the testimony of this same successful grower. "The leaf wants close attention in the curing barn, but it does not require a vast amount of experience to get a good cure. The best men in this district have picked it up in three or four seasons. No hard and fast rules can be laid down," he continued.

practice is an unsound one, and probably it is better to go a bit too slow than too quick. The serious outbreaks of blue mould in recent years have something to do with the occurrence of this fault. One effect of the disease is to cause delay in planting out the seedlings in the early spring. The result is that before the crop has matured frosts are threatening, and the grower, anxious to cure the whole of the leaf if possible, endeavours to push the successive batches through the barn. The effect is the scorching referred to, and the splotching, which is a serious depreciation.

Of dark tobacco leaf, little or none was seen. Possibly its absence was one reason for grading not being as thoroughly done as it might have been, for with more dark leaf in the crop there would have been need for greater care in grading—a care that would have had its influence on the whole job. As it was, the crop chiefly consisted of mahogany, varying from medium to bright with a small proportion of lemon, and, of course, the defect of splotching most to the fore.

Mould is the *betê noire* of the tobacco-curer and of the manufacturer. The blue mould that attacks the crops in the field is unavoidable, but leaves seriously damaged are generally put right out by the growers. The mould that attacks the leaf after it is cured is rather a different matter, and should be regarded as avoidable. In a district like the Upper Murray, where heavy winter fogs that saturate everything are common, the danger of mould is great, for the cured tobacco leaf readily absorbs moisture from the atmosphere, and mould is the inevitable consequence. As prevention of the fogs is impossible, their effects must be minimised. This can be done by doing the "bulking down" in well-constructed sheds that as far as possible ensure uniform atmospheric conditions. The importance of such sheds most growers of the Upper Murray, and in the State generally, have yet to realise. Several of the sheds in which the bulking had been done, and in which the leaf had been kept in bales until the visit of the buyers, were simply small galvanised iron structures in which every variation of temperature would be felt, and which could not for one hour shut out the heavy fogs of the winter and early spring. Under such conditions the tobacco leaf could not but become moistened and chilled, and must depreciate accordingly. How essential these precautions are was illustrated by the admission in more than one case that the bales had not opened up quite so well to the buyers as the grower had expected. This was true even in the case of the largest bulking shed seen. There, with plenty of room, with the bales raised well off the ground, and with plenty of bags used as covers to exclude atmospheric variations, the grower still confessed himself disappointed that his line had not opened up a bit brighter. Certainly there was a proportion of high-class leaf—some of the best seen on the trip, in fact—but the line as a whole was not so good, in his judgment, as when it was baled. All of which goes to emphasise the importance of the bulk being carefully inspected at frequent intervals —the Tobacco Expert would say at least once every week or ten days— so that any bulk showing signs of mould may be opened up, the hands lightly shaken out, and the lot rebuilt.

has undoubtedly been the production of a larger proportion of choicest than ever, and it may be expected that a little stricter grading of tobacco will, in a few years, have a levelling-up effect upon the whole of the product, to the great benefit of the whole industry.

Much less doubt attaches to the inclusion of distinctly inferior leaf in the first grade. In one or two cases the grower was obviously surprised at some of the hands produced from the bales by the buyers in their sampling operations—hands that were not even good enough for the next grade below. Some owners confessed that their wishes in regard to careful grading had evidently not been carried out, but the buyer had to deal with things as they were, and if in the protection of his firm he erred on the side of caution, who could blame him?

In one case the best grade included a few hands of the poor, trashy leaves near the ground, which are made by the plant while it is still quite young. One of the buyers remarked that in America the grower goes round the crop when it is nearly ready to cut and strips these leaves off, leaving them on the ground as worthless or as costing more to handle than they are worth. The presence of product of this class (from which a good deal of the leaf had gone and only stem remained) in the best of three grades surely suggests that the grower "was not looking just then."

Some advantage might have been derived in one or two cases by three grades where only two had been created, but, on the whole, it would appear that it is a mistake to create too many grades. In one case five grades were presented, but the single bale of rather ill-conditioned stuff that made up the lowest grade was declined by the buyers, and the comment was made that had the contents of that particular bale received a little special attention in bulking down and been graded with the fourth-grade leaf it would have been taken at probably 1s. 3d. per lb. at least. As a matter of fact, the buyers suggested that the bale might be opened up, handled, and regraded with advantage, and then resubmitted to them—an incident that, with others, proved their consideration for the growers.

Common Faults in Curing Tobacco.

The errors of judgment likely to occur in the curing of tobacco-leaf were, of course, reflected in the product.

"Sponged leaf" was only occasionally seen, which testifies that growers are beginning too understand flue-curing. Spongy leaf is the result of failure to drive off the moisture fast enough in the early stages—in other words, failure to raise the temperature fast enough at first with simultaneous lack of ventilation for the moisture to escape.

The opposite fault—raising the temperature too fast—is represented in the cured product by "splotching," which is really the result of scorching. This was certainly the commonest fault seen in the crop—probably the commonest of all faults among the tobacco-growers of his State. With some idea of the possibility of sponged leaf, it is perhaps natural for the grower to go to the other extreme and to raise the temperature too fast, but the

that Dr. Darnell Smith and Mr. Tregenna now connect with cold conditions in the early stages—conditions that are liable to occur on these flats. The effect on the crop of fogs is more apt to be felt after the leaf has been gathered and cured, when, unless the bulk is well protected in a good bulk-shed from the damp atmosphere outside, mould is likely to make its appearance.

Taken in a general way, however, the Upper Murray is singularly favourable to the production of leaf of good quality, and in the present season nothing better was produced in the State. One or two of the crops purchased, in fact, were probably better than the best of many other districts, and had the lemon-coloured leaf in certain lots been graded separately instead of being mixed through several bales of medium to bright mahogany, a quite fancy price would certainly have been touched.

It will be gathered that the quality of the leaf seen was, on the whole, distinctly good, but with such a delicate product as tobacco, the partial processing of which (as well as the growth) is carried out on the farm, any faults that characterise several parcels are of importance.

Some Lessons in Grading.

Perhaps a certain lack of finish in the grading was the outstanding feature of the parcels seen on the trip. Not that growers had not made an effort to grade their lines, for they had certainly exercised a good deal of discrimination. Only one of the lines inspected had not been divided into two grades, and one was actually in four, and another in five grades. The work had not been done with the accuracy that is desirable, however. In one or two cases the same bale included a small proportion of the choice, lemon-coloured leaf that the buyer is ever on the look-out for, a large proportion of mahogany varying from medium to bright, and a few hands of a dark, unattractive quality that the buyer regarded with concern lest the quantity should be larger than appeared.

Admitting the buyer's liking for a strict grading that keeps the high-class lemon-coloured leaf by itself, the preference of the grower is to tone up the quality of his best grade by the inclusion of the really choice leaf. He argues that a bale or half-bale of the lemon-coloured leaf might indeed command 3s. per lb., but what about the effect on the price of the five or ten bales that make up the balance of the line? Would he not perhaps lose by strict grading? One sample included some very atractive lemon-coloured leaves, and, counting one or two hands, it was found the choice quality formed about one-sixth to one-seventh of the whole. The price paid in this case was 2s. 6d. per lb., and the grower, no doubt, questioned whether an increase of the price on the one-sixth would not have been more than discounted by a decrease of the figure paid for the five-sixths.

Be all this as it may, it may be remarked that in all other kinds of primary production grading is becoming a distinct feature, one effect of which has been the recognition by the producer that he must keep up the general quality of his product. The effect, for instance, of strict grading of butter

Growing and Grading Tobacco.

IMPRESSIONS GATHERED ON THE UPPER MURRAY.

W. H. BROWN, Editor of Publications.

THE adage that the crop is never safe till it is sold and the money in the bank is probably more true of tobacco than of anything else. The rewards attending the production of the leaf under favourable conditions of soil and climate are certainly attractive, but vicissitudes attach to the business at every stage right up to the time when the crop has been baled ready for market. Indeed, even then the possibilities that there may be depreciation in quality are not over, for the slightest relaxation of care in final baling up or any excessively unfavourable atmospheric conditions while waiting for the buyer's visit may have quite appreciable consequences.

These considerations came prominently before a party consisting of several tobacco buyers, the tobacco expert of the Department (Mr. C. J. Tregenna), and the writer, during a tour of the Upper Murray in the middle of October.

The Upper Murray as a Tobacco District.

The rich, undulating lands around Albury give place, as the traveller faces eastward, to steeper hills that close in upon the narrow valley, along the floor of which winds the clear, deep, swift-flowing, icy-cold waters of the Murray River. In patches the hills afford good grazing, but for the most part they are rather poor and do not offer much encouragement for development. The flats, which, until the tobacco-growing areas are past, nowhere exceed a mile or mile and a half in width, are rich and fertile, and prompt the reflection that the day must come when, instead of being almost entirely devoted to grazing, they will be made to yield fodder crops that will immensely increase the carrying capacity and the security of neighbouring pastoral areas. Already a few patches of lucerne, maize, and Sudan grass may be seen—sure forerunners of better days for this beautiful valley.

The soils on these flats, instead of being of the heavy, dark loam usual on river bottoms, are of lighter, sandier, and more friable texture—just the kind of soil that is essential to the production of the fine-textured, light-coloured leaf now generally preferred by smokers. The climate, too, is remarkably favourable. Behind are the warm to hot plains of the lower Murray, while in front the hills roll eastward and upward to the tablelands that culminate in the snows of Kosciusko, nearly 100 miles away, but here in this narrow valley neither heat nor cold is excessive; instead, there is a uniformity of temperature and an absence of sudden changes. The rainfall, running from 30 to 35 inches per annum, is well distributed and quite close to ideal. One fly there is in the ointment. The proximity of the river tends to make the atmosphere somewhat humid in the summer, and damp and foggy in the winter, circumstances that have their influence on the crop. Once only has there been a serious outbreak of blue mould, a disease

The membership contract is still considered a useful device in starting a new organisation, and to some extent in keeping old members in line, but "membership relations" is much broader than a mere contract. No phase of co-operation is being stressed more to-day than "membership relations." In a few cases the so-called "talking locals" are serving fairly satisfactorily.

The issue between highly centralised business management and democratic control of management is being drawn more clearly, with co-operative leaders lining up on both sides. It will probably work itself out in form of a division of responsibility between the members and their local and the central management. Some decisions need to be made by one and some by the other.

Imports and Exports of Fruit.

The following table, compiled by the Government Statistician, shows the imports and exports of fruit—fresh, dried, and processed—during the quarter ended 30th September, 1925:—

Description.	Imports.	Exports
Interstate.	Cases.	Cases.
Fresh Fruit ...	438,870	224,091
Tomatoes ...	104,188	...
	doz.	doz.
Melons ...	......	29
	Bus.	Bus.
	......	176
	lb.	lb.
Canned Fruit ...	4,536	336
Dried Fruit—		
Unspecified ...	3,220	1,288
Currants ...	4,648	280
Raisins ..	15,288	494
Apricots ...	942	...
Apples ...	924	...
Prunes ...	1,736	560
Pears	392	...
Sultanas ...	644	...
Peaches ..	1,232	...

Description.	Country of Origin.	Imports.	Exports.
Oversea.			
Fresh Fruit—		Centals.	Centals.
Citrus	....	1,638	49,920
Apples ..	....	...	1,303
Pears	....	...	316
Pineapples ...	.. ..	...	2,792
Bananas ...	....	264	221
Other	....	88	1,612
Dried Fruit—			
Apples, Pears,		lb.	lb.
Peaches, etc.	Commonwealth..	30	...
	U.S.A.	2,025	...
Apples ...	....	...	9,398
Apricots ...	....	...	196
Currants ..	....	...	27,644
Prunes ...	U.S.A.	13,746	502
	France	560	...
Raisins—			
Sultanas ...	....	...	6,291
Lexias ...	....	...	4,576
Other ...	U.S.A.	180	205
	Asia Minor ...	17,114	...
Dates	Mesopotamia ...	109,545	5,867
	Algeria	8,006	...
Other	Asia Minor ...	3,065	2,179
	China	1,992	...
	Spain	1,400	...
	U.S.A.	6,780	...
	United Kingdom	330	...
	India	4,480	...
Preserved in liquid—			
Apricots ...	....	...	1,240,906
Peaches ...	....	..	1,669,218
Pears ...	....	...	66,200
Pineapples ...	....	...	3,462
Raspberry Pulp	....	...	2,909
Other ...	....	...	21,104

of the member. In view of the fact that the continued success of a society depends upon the certainty of support, the importance of this power is evident. This matter is, however, highly controversial, and there are two distinct opinions within the co-operative movement, one favouring the view that the joining of a co-operative society involves whole-hearted support—because it is co-operative and because it has certain objects—the other maintaining that although it is a co-operative concern and the property of the members, it only merits support as long as, by well-directed policy and good management, it can fill a place on its merits in the economic need of the producers concerned, maintaining also that if this be the case then no contract is necessary, and that if it be not the case then no contract will long hold members to a concern that is not economically sound.

The case is not actually quite so simple, for, though economically sound, a concern may not be able to hold its members' loyal support, by reason of the fact that those in opposition may decide to run their concern temporarily at a loss in order to destroy a co-operative venture which is relying upon the voluntary support of members, such members not always recognising the tactical significance of the opposition's terms. This question was debated at the Institute of Co-operation, the consensus of opinion appearing to be in opposition to the contract system. It is quite conceivable that as the movement makes progress and the principles involved are better understood and the management is generally on a better basis, the necessity of a contract will disappear. That appears to be the trend of opinion in the American movement, as is indicated by the following passages from Mr. Black's report:—

> The newest idea in co-operation seems to be to select the members, instead of signing up everybody in order to get full control of the product. A number of associations are actually trying out the plan of requiring two members to vouch for each new member.
>
> Therefore, in place of enforcing membership contracts, the most generally approved present procedure seems to be to adjust the member's difficulties if possible and show him the error of his ways, and if this does not suffice, kick him out of the organisation. Enforcing membership contracts should be resorted to very sparingly, if at all.
>
> Whirlwind membership drives are generally undesirable, because they bring into an organisation a large number of people who do not understand it, or who by nature will not make good co-operators.
>
> The idea of getting complete or nearly complete control of the product so as to be in a monopoly position is subsiding rapidly among the real leaders of the movement. A volume of business is essential to success, but a reasonable volume of business from a body of good co-operators is the proper objective.
>
> The notion of a separate organisation for each commodity is losing ground rapidly. Both in the central and in the local market, the handling of several products is proving advantageous in many cases, because it keeps plant, equipment, and personnel engaged upon a year-round basis, and makes it possible to set up marketing units in places where one commodity alone could not stand the cost.
>
> Co-operative buying is making much slower progress than co-operative selling, but is proving successful in a number of cases, especially as an adjunct to co-operative selling.

The Co-operative Movement.

Some Recent Trends.

C. O. CRANE, B.A., Agricultural Bureau Organiser.

The New South Wales Co-operation, Community Settlement, and Credit Act provides for the registration of co-operative societies of several kinds, each for a different purpose; for the affiliation of societies of the same kind to form associations, and the affiliation of associations of all kinds to form a union. Such a programme indicates the need for centralisation, and clearly states that such a federation should be built up on the membership of registered societies. It is interesting to note that the co-operative movement in America has produced two distinct schools of thought in this matter, the one school claiming that the above method of federation is desirable, the other claiming that better and speedier economic results would be obtainable by a centralised organisation on a comparatively small scale, but capable of expansion as individuals link up with it as members throughout the State. Both schools of thought can produce in support of their opinion apparently sound arguments based on practical experience, and it is difficult to say what the final evolution will be, or whether the two systems will run parallel in competition with each other. At the American Institute of Co-operation, which recently held a four weeks session, the cross-firing of the two schools did much to reduce the issue by removing confusion of thought on both sides, and towards the end of the conference there was a growing unanimity, which was summarised by Mr. J. D. Black, in *Hoard's Dairyman*, as follows:—

> Practically all agree that some form of a local is a necessary part of a co-operative organisation, and that these locals must really function and must be given some important powers and obligations. If the locals already exist, the thing to do is to federate them. If they do not exist, then the thing to do is to set about bringing some into existence—by gradual stages, of course. Several large co-operative organisations are pushing in this direction at the present time. There is, however, no use in setting up a local unless it is given something worth while to do.
>
> As to whether, in case there are no locals in existence, it is well to organise a centralised organisation and create the locals afterwards, or to wait until locals can be developed, there is no general agreement; but the majority opinion is in favour of the former procedure, especially if the need for better marketing is very urgent.
>
> In any case, the proper procedure is to put on a general campaign of education among the growers before starting the membership campaign, and to extend this educational campaign over two or three years if possible. This is a programme in which the whole educational system of the State can be utilised.

Another important section of the New South Wales Act empowers the use of a contract as between a society and its members, such contract containing penal clauses in the event of disloyalty to the contract on the part

RESULTS of Fertiliser Trials.

Fertiliser per acre.	Condong. (Leaming).		Casino. (Fitzroy).		Raleigh. (Leaming).		Raleigh. (Fitzroy).		(Bellingen). (Fitzroy.)	
	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.
*M2, 224 lb.	48	35	47	49	88	22	101	10	129	36
*M1, 238 lb.	51	32	94	16	86	52	88	22	106	4
*P7, 168 lb.	42	41	62	34	72	11	94	16	111	54
Blood and bone, 224 lb. ...	46	23	53	2	73	37	95	43	114	51
Superphosphate, 182 lb. ...	44	11	83	55	86	52	....		103	7
No manure	42	20	63	40	58	52	73	37	100	10

* M2 mixture consists of 13 parts superphosphate and 3 parts sulphate of potash; M1 of 4 parts sulphate of ammonia and 18 parts superphosphate; P7 of equal parts superphosphate and bonedust.

It will be seen from the above trial that practically all plots responded to the application of fertiliser. At Condong and Casino M1 mixture gave the largest increases, whilst at Bellingen and Raleigh M2 gave the greatest response.

TWO POISON PLANTS.

DURING the last few weeks, writes Mr. Max Henry, Chief Veterinary Surgeon, large numbers of plant specimens have been received from Inspectors of Stock for identification and report by the Government Botanist, and for any information known concerning their effect on stock. Among those recently sent in was the Cape Tulip (*Homeria collina*), one of the worst of poison plants, which is often eaten by cattle newly introduced to a locality, with consequent excessive purging and death. Animals continually kept on country infested with it appear to avoid it. As it usually occurs on circumscribed areas, it should be eradicated wherever possible.

A vine from the North Coast, *Marsdenia rostrata,* which was recently shown by experiments carried out at Glenfield Research Station to be definitely poisonous, has again been forwarded as being associated with mortality in stock.

DRAMA OF A DUCKLING.

"I HAD a curious experience to-day that might interest readers of the *Agricultural Gazette,*" writes a lady correspondent. "I had just come back from town, and as I drove in our gates, sitting under the small gate I saw a little yellow duckling. Before I could stop and get out of the car it had disappeared—no sign of any more or any mother duck either. Just close to my fence was a heap of rubbish, grown over thick with vines. After pulling this to pieces the little duck ran out—a most sturdy little fellow. But here's the mystery: After further rooting about I found a small paper bag like you buy at the grocer's with sugar or eggs, &c., in. In it were four broken eggs—three with dead bodies of ducks covered with maggots and some more broken shell. How the eggs got there, and how the eggs got hatched and the one small duck survived, I cannot think. I think he must be destined to great things, that duck. Anyway, I've promised him he shall not be eaten."

Cultural Details.

Condong.—Soil, alluvial loam; previous crop, oats for green fodder. Land ploughed as soon as the oats were harvested, and worked up into good condition for planting. Planting carried out in rows 3 feet apart on 14th October, 1924. All plots were harvested on 16th March, 1925.

Casino.—Soil, heavy volcanic; previous crop, Saccaline, harvested during the winter and the land ploughed early. Planting was carried out on 18th December, in rows 4 feet apart three grains dropped every 3 feet in the rows. Harvesting carried out on 12th June.

Raleigh.—Soil, alluvial loam; previous crop, oats. The early varieties were planted on 10th October, and harvested on 21st April; the late varieties were planted on 20th November, and harvested on 17th June. Planting was carried out in rows 4 feet apart, single grains being dropped 12 inches apart in the rows.

Bellingen.—Soil, alluvial loam; previous crop, pumpkins. Land ploughed early in winter, and in splended order for planting. Planting carried out on 19th November in drills 4 feet apart, single grains being dropped 12 inches apart in the rows. The crop was scuffled twice, but not hilled. Harvested 12th June.

RESULTS of Variety Trials.

Variety.	Condong.	Casino.	Raleigh.	
			Early Varieties.	Late Varieties.
	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Craig Mitchell	45 38	......	88 22	......
Hickory King	33 50	......	85 25	......
Iowa Silvermine	31 38	......	91 19	......
Funk's Yellow Dent	28 0	......	73 37	......
Leaming	42 20	......	58 52	......
Funk's 90-day	......	......	82 28	......
Golden Superb	43 26	......	64 49	......
Boone County White	......	......	41 14	......
Coodra Vale	31 38	......	55 55	......
Yellow Hogan	......	77 2	......	82 8
Fitzroy	......	63 40	......	73 37
Large Red Hogan	......	54 29	......	109 1
Golden Beauty	41 14	......	......	53 32
Pride of Hawkesbury	......	50 46	......	......
Large Yellow Horsetooth ...	......	......	......	47 8
Cocke's Prolific	......	27 14	......	......

Fertilising trials were conducted at the above centres under the same conditions as the variety trials; also at Bellingen.

Farmers' Experiment Plots.

MAIZE TRIALS, 1924–25.

Upper North Coast District.

M. J. E. SQUIRE, H.D.A., Agricultural Instructor.

THE following farmers co-operated with the Department in experiments with maize during the season 1924–25 :—

H. Johnson, Condong.
C. Oliver, "Laureldale," Casino.
M. McBaron, "Riverview," Raleigh.
R. W. Hindmarsh, "Wiaraga," Bellingen.

Experiments were also sown at Shark Creek and Deervale. At the former centre the plots were destroyed by floods, as the crop was maturing, while at the latter heavy continuous rains and cool weather were experienced at tasselling, with the result that very few cobs "filled." The crop was used for cow feed.

All plots made fairly good growth during the early stages. As the crop advanced, however, owing to continuous rains and cool temperatures, growth was slow, maturity being somewhat delayed.

The advantages of selecting seed from ears which were well covered with husk was clearly demonstrated during the past season. In all cases where the cob was badly covered, or the husk had been damaged, so as to allow moisture to enter, mould had set in and in some cases the whole ear had been destroyed.

The rainfall during the growing period was as follows :—

RAINFALL.

Month.	Condong.	Casino	Raleigh. Early Varieties.	Raleigh. Late Varieties.	Bellingen.
	points.	points.	points.	points.	points.
Oct., 1924	43	....	198	....	....
Nov., „	469	....	468	95	91
Dec., „	289	....	699	699	488
Jan., 1923	177	284	584	584	655
Feb., „	194	223	405	405	184
Mar., „	1,388	196	1,096	1,096	1,203
April, „	....	258	321	321	492
May, „	....	643	....	1,250	1,256
June, „	....	....	....	120	110
Totals	2,560	1,604	3,771	4,570	4,479

A Common Source of Infection with Flag Smut.

E. S. CLAYTON, H.D.A., Agricultural Instructor.

DURING the last few years flag smut has been spreading at an alarming rate, and at the present time it is hard to find a wheat crop entirely free from this disease. It has been found that a prolific source of infection is the feeding of chaff made from wheaten hay infected with flag smut.

Many farmers, realising the losses caused by this disease, make vigorous efforts to rid an infected paddock. They burn the stubble early, grow a crop of oats, then bare-fallow the land. By this means the flag-smut spores in the soil are starved out. Unfortunately, in most cases the treatment ends here, and the land is reinfected by horses which have been fed on flag-smutty wheaten chaff. The process of passing through the stomach and intestines of the horse does not destroy the flag smut spore, a point which, unfortunately, is not generally realised by farmers. Where it is known, insufficient attention is paid to the fact.

In districts in which smut is prevalent farmers would be well advised always to feed their horses on oaten chaff, as oats are not generally affected with flag smut. Some farmers object to using oaten chaff on account of the risk of spreading black oats, but if a paddock is dirty with black oats, wheaten hay cut from the paddock will contain as many wild oats as will oaten chaff. The idea—still held by a few—that cultivated varieties of oats rapidly degenerate into black oats is erroneous.

There is no sound objection to the feeding of oaten chaff, while the growing of oats provides a welcome change for the land from continuous wheat culture. Adoption of this practice would tend appreciably to reduce the annual losses from flag smut.

Dr. R. J. Noble, Principal Assistant Biologist, expresses his concurrence with Mr. Clayton's views, stating that, although in his opinion direct infection of the land from flag-smutty crop is the chief means of the spread of the disease, the most frequent cause of initial infection in new land is the practice referred to. The more use farmers make of oats the better; the crop is an important feature in the programme of flag smut control.

A WHEAT-GROWER'S TRIBUTE TO FALLOW.

THE basis of all good farming is fallow. The basis of maximum crops every year on that fallow is good cultivation and superphosphate. This, in turn, will give a foundation of a prosperous farm, and lead one from the period of money-saving to that of high production and money-making.—W. W. WATSON, Tichborne.

enlightenment can be given it is only too eagerly received, and where better methods can be suggested the farmer is only too willing to adopt them, with the result that the quality is improving and the amount of second-grade cream is diminishing.

The work of the dairy instructor is one which is responsible to a large extent for the lowering of the percentage of inferior butter manufactured, and the raising of the quality and percentage of the choicest butter produced in this State.

The experiences narrated in this article were obtained in the Hunter River Valley district, one of eight districts where this work is now being vigorously carried out. The present instructional staff of the Dairy Branch is limited to twenty, but the scope of this important work is sufficient to employ double the number. The staff is being built up, however, and trained as rapidly as the limitations of finance and available material for future officers will permit.

For Clean Sheep.

Seventy-five holdings were placed in quarantine for lice and tick infestation during October, 1925, and Inspectors of Stock are exercising great activity in this matter. As an instance of the value of propaganda and the imposition of quarantine, it may be pointed out that in Condobolin, in addition to the fifty dips in the district at the beginning of last shearing, fourteen new dips have been constructed, of which three are community dips. A number of dips have also been constructed in Coonamble.—Max Henry, Chief Veterinary Surgeon.

Improve your Pastures.

Up to the present the sheep men of Australia have been content to ringbark, sucker, pick up and burn, and to conserve water, but the idea of supplanting the natural grasses with more succulent and heavier-carrying grasses and clovers has not received serious consideration. Improvement of pastures means not only two or three times the present carrying capacity, but also that the sheep will be well fed, and where you struggle through now with about one indifferently-fed sheep to the acre, you will carry two or three times that number of well-nourished animals. This means bigger sheep, heavier weight of wool—certainly not so high-yielding, but more money per head—a bigger percentage of lambs, and (perhaps one of the main assets) fat lambs.

It is the idea of most people on the land, as soon as they make sufficient money from their holding, to launch out and buy more land. This, I contend, is a wrong policy. What the farmer should do is to put the money he has made out of his land back into it and improve his pastures.—C. E. Prell, Crookwell, in an Agricultural Bureau paper.

The whole of the plant was dismantled and thoroughly cleaned, taking three days to properly sweeten. The cleaning was officially supervised. Since then the cream has graded choicest quality, and no further trouble has been experienced.

As before stated, 75 to 80 per cent. of second-grade cream in this district is caused by improper methods of washing utensils, separator parts, &c., but frequently other causes are met with, as a few further cases will show.

Some Other Causes.

A fairly large supplier to the Branxton butter factory was having considerable trouble with his cream. On visiting the farm it was found that the bails, dairy, utensils, and water supply were all in splendid condition, and on all outward appearances the cream produced should have been of choicest quality. The separator was driven by a motor and the exhaust from this motor was exploding in the separator room. Behind the separator were two windows which caused a strong draught of air—the separator being situated between the windows and the engine. As soon as the engine was started and separation commenced, the warm cream received the full effect of the fumes. A piece of iron piping was procured, a hole was made in the roof of the dairy, the pipe was connected to the exhaust, and the fumes were carried away. The cream now grades choicest at the factory.

Cream cooling and stirring are two points which are sadly neglected by a large percentage of the farmers in Hunter River district. They are essentials which are being strongly recommended for constant attention.

In parts of the Hunter Valley, where at certain periods of the year there is a large growth of herbage and taint-producing weeds, a far higher quality cream could be produced if frequent stirring were carried out, combined with a system of cooling. This stirring and cooling would give the gases a far better chance of being liberated, as well as keeping the casein in suspension.

One point that constantly comes under notice is that among a large number of the suppliers visited only a small amount of importance is attached to the condition of the cow-yards and bails, and frequently these are found to be in a state of neglect. Large manure heaps close to the bails, causing bad smells, are frequently met with; dusty yards, caused through the droppings being left in the yards and trodden into powder by the cattle, and occasionally dirty milking, are all faults that we are trying to convince the farmer cause high contamination, for very often the milk is infected by undesirable bacteria before ever it reaches the separator. At this stage, being at a body temperature, the milk readily absorbs bad odours and taints.

By tactfully approaching suppliers who have been troubled with second-grade cream, by pointing out causes of such deterioration as we have illustrated in this article, by explaining how these causes affect the cream, and then by giving instruction in better methods of handling and care, a good response in the great majority of cases has resulted. It is found that where

farm was constantly graded second quality. Upon inspection the dairy and bails were found to be in a splendidly clean condition, but on examination of the vat tap it was found that it had been soldered on, and there was a cavity of about half an inch on the inside of the soldered joint which was filled with decomposed milk of a putrid nature. The vat tap was renewed and the trouble cleared up.

Milking machines have given considerable trouble, on account of both improper cleansing of the milk system and neglect to properly wash the vacuum system.

In connection with the cleansing of the milk system, the biggest trouble has come through the teat cups and rubbers. Very often the rubbers are used until they are in a perished state before there is any thought on the part of the farmer of renewing them. After instruction has been given in methods of washing, the farmer is always strongly advised to steep the rubbers in a clean solution of lime water. This keeps them sweet and greatly diminishes the rubber taint.

Neglect and oversight in keeping the vacuum tank sweet have in more than one case been the cause of second-grade cream.

A very striking illustration of this was afforded by a well-known estate which was supplying cream to the Singleton Co-operative Dairy Company. For a considerable period cream had been constantly graded second class by the factory certificated grader. The manager of the estate had done his best to find the cause of trouble, but could not, and he asked that an officer of the Department be sent out. As a result of the investigations made by the Dairy Branch staff, the dairy premises were found to be well kept, but the vacuum tank was found to be in a shockingly filthy state, being half filled with a decomposed milky substance, the smell of which was tremendous.

Samples of this decomposed milky substance were forwarded to the Department's Biological Branch, together with the connecting rubber tube from the vacuum tank to the distributor, and the report thereon was as follows :—

Sample 1.—A thin liquid of greyish-black colour and putrid odour; plates made in 1/5,000,000 were uncountable. The organisms were those found in milky matter in an advanced stage of decomposition. It is thought that one drop of this putrid material if added to milk or cream would cause, in the course of twenty-four hours, objectionable flavours.

Sample 2.—Rubber connection. This piece of tubing was corroded with a moist, dirty white matter of objectionable odour. The organisms found were those common in putrefying milk or cream. Such tubes would be a serious source of contamination to milk or cream coming in contact with them.

The farms visited by the instructors are only those from which second quality cream has been supplied to the factory—cream which he has seen and graded, and as to which he has a very good idea of where to commence his search for the cause of trouble.

The Work Done.

From the beginning of February until the end of November, 1924, 273 suppliers of second-grade cream were personally visited by the field staff of the Dairy Branch in the Hunter River district. The factories to which this cream was being supplied, were Denman, Bowthorne, Singleton, Branxton, Aberdeen, Dungog Co-operative Co., Dungog F. and D. Co., and Gresford.

As stated, the dairies visited by the instructor are only those which have supplied second-grade cream, and as a natural result it is to a large extent with the worst farm conditions existing among suppliers to the factories that he comes in contact. In most cases the farmers are only too pleased to receive the advice and instruction given, and to carry it out. The response and improvement in the quality of the cream are very encouraging.

Principal Causes of Trouble.

From 75 to 80 per cent. of the trouble in connection with second-grade cream in this district comes from the faulty washing of the utensils and separator parts. In a number of cases, these utensils, &c., are washed reasonably clean, but washing soda has not been used in the water, with the result that a greasy surface remains. This is most noticeable in the case of the discs, which are often hung up to dry, with the result that when the day becomes hot the heat produces a tallowy condition, or a greasy surface on the discs. In the afternoon the separator is assembled, often standing for half an hour or so before being put into action. During that time the smell increases, and when the process of separation begins, the milk (passing into the bowl in a warm condition), absorbs the smells and eventually an inferior cream results, which is often separated into a greasy, tallowy-smelling, benzine tin.

Then again, in washing the separator parts, a cloth is more often used than a brush. This cloth, after being used, is frequently left in a wet heap on the bench inside of the wash-up vat, where it remains until it is required at the next washing. It very rarely dries properly, and being a cotton fabric, it readily absorbs bad smells and goes musty, rancid, and putrid, and imparts to all the utensils, separator parts, and water, a smell sufficient to turn any cream. This is one of the most common sources of trouble met with here.

The vat tap and connecting pipe are two places that are also frequently sources of high contamination, for if they are not taken to pieces after each use and thoroughly washed and brushed out, milk accumulates and decomposes, with injurious results. An example of this may be quoted from the farm of a supplier to the Branxton butter factory. The cream from this

cent. of the cream separated on the farms will be manufactured into choicest quality butter, suitable to carry the "Kangaroo" brand of excellence. When that point is reached, efforts will be continued to eliminate the balance of the lower grades, for we cannot be satisfied until the whole output is of the highest quality.

The quantity of choicest grade butter made in New South Wales factories last year was equal to 82 per cent. of the total production.

The Dairy Instructor and the Dairy Farmer.

It is now generally accepted that instruction to the farmer at the dairy upon modern methods of handling his raw product is the basis of the uplifting of butter quality. For the manufacture of choicest quality butter in the butter factories, it is essential that the cream should be sound upon arrival, and as far as possible free from bacterial contamination. Unfortunately, far too much cream of second grade is delivered to our factories; this is manifest when examination is made of the creams on the receiving platforms at the factories.

Many and varied are the causes of this inferior quality, but its condition when examined at the factory is no more than an indication to the instructor as to the cause, for it is only by personal visit to the dairy concerned that the actual cause can be located and a remedy suggested. The examination of the cream by the instructor at the factory enables him to form an opinion as to the causes that may have affected it, and upon a visit to the dairy the cause is invariably located and suggestions made to the responsible person concerned as to the necessary improvement.

To achieve the best results it is essential first to get the farmer to appreciate that the visit is "one of instruction and help," for if his attitude is hostile the instructor's efforts and time are wasted. On the other hand, a "liaison" between farm and instructor being established, the instruction given is effective and satisfactory results are obtained.

The greatest advance of the dairying industry in New South Wales during recent years has been made in connection with the quality of the butter manufactured, due chiefly to improvements in construction, equipment, and operation in dairy produce factories, but it must be borne in mind that the quality of the butter manufactured depends largely upon the quality of the raw material received. Choicest butter cannot be made from inferior cream.

It has been officially stated that about 20 per cent. of the butter manufactured in this State is below choicest quality, which means that a large percentage of this cream when received at the factory was of inferior quality, and it is in the lowering of the percentage of second-grade cream produced and butter manufactured that the work of the dairy instructors is now making rapid strides.

The amount of New South Wales butter exported overseas in the year ended 30th June, 1925, was equal to 19·4 lb. per head of population. The amount consumed within Australia was equal to 35 lb. per head of population (State), and the amount consumed in New South Wales was equal to 30¾ lb. per head of State population. Taking an average of the last eleven years, the production of all grades of factory butter in New South Wales comes to under 77,000,000 lb. per annum. The requirements for the local trade for the past twelve months for choicest grade alone was equivalent to 76,000,000. Next year this will be further increased.

In normal production years, therefore, New South Wales requires all the choicest butter it can produce for its home trade. The annual increase in production of our dairy herds and farms is not sufficient to cope with this increased demand. It will thus be seen how urgent is the necessity for the instruction of those dairy farmers who are sending inferior quality cream to factories, in order that the amount of second-class butter manufactured may be reduced to the smallest dimensions.

It is with these objects that the Department is giving so much attention to this class of instruction, and for this reason, also, the Government has now granted approval to appoint additional instructors to the staff of the Dairy Branch.

The Value of Local Bacteriological Examinations of Cream.

The skilled instructor was formerly often at a loss as to the cause of the deterioration in quality of certain creams delivered at the factory. He could take samples in sterilised bottles and forward them to the Department's laboratory in Sydney for bacteriological examination, but this method did not give the best results. In many cases the sample was broken in transit, and even if it arrived safely the period of time which had elapsed between the taking of the sample at the factory and the making of the plate at the laboratory in Sydney was sufficient to permit of a great development and variation in the numbers and types of the micro-organisms contained in the cream.

It was therefore found advisable to make provision for the first examination to be carried out at the factory and a check sample sent to headquarters laboratory. The manufacturers were asked to assist the Dairy Branch by providing a room for a laboratory and equipping same sufficiently to enable the preliminary scientific investigation to be made on the spot. Many of the new factories constructed, or now being constructed, in such great numbers, are equipped in this way, thus enabling the instructor to double his efficiency and obtain much better results.

With the provision of modern dairy produce factories, constructed and equipped to the high standard required under the Dairy Industry Act of this State, and with the instruction being given to dairy farmers and manufacturers, it is hoped that such an improvement in the quality of the dairy produce manufactured will be shown in the near future that 90 per

First Notice.

DEPARTMENT OF AGRICULTURE.
Dairy Branch.
Dairy Farm Instruction.

Instructor—C. S. Kentwell. *Date*—1st September, 1924. *District No.*—. *Date of Visits*—26th and 28th August. *Suppliers to* Singleton Dairy *Factory.*

Names and Addresses of Farmers Visited.	Quality of Cream.	Remarks and Instructions Given.
Cream Supplier X.................. Singleton	2nd	Trouble due to an accumulation of stale milk in vacuum tank, causing very offensive odours throughout the whole of the milking machine system. All rubbers and pipes being in a bad state. *Instruction.*—Ordered new rubbers throughout. Took the plant to pieces and personally supervised the thorough cleaning and disinfecting of same. Advised the keeping of rubbers in a solution of lime water.

Second Notice.

DEPARTMENT OF AGRICULTURE.
Dairy Branch.
Dairy Farm Instruction.

Instructor—C. S. Kentwell. *Date*—26th September. *District No.*—. *Date of Visits*—18th September, 1924. *Suppliers to* Singleton Dairy *Factory.*

Names and Addresses of Farmers Visited	Quality of Cream.	Remarks and Instructions Given.
Cream Supplier X.................. Singleton	...	A personal visit by myself was made on the 18th instant, and everything was found in a satisfactory condition. The cream has also improved in quality, and is now grading choicest at the Singleton Dairy Co-operative Co's. factory.

Factory Manager's Report.—

The Singleton Central Co-operative Dairy Co., Ltd.,
Singleton, 26th September, 1924.

Dear Sir,

The cream received from Cream Supplier X.............. subsequent to Mr. Kentwell's visit has shown a considerable improvement.

All consignments received since 1st September, with one exception, have been graded choicest.

Yours faithfully,
G. S. LEE,
Manager, Singleton Central Co-operative Dairy Co.

The Dairy Expert,
Department of Agriculture, Dairy Branch,
Sydney.

instructor for reference. After a lapse of six weeks the Dairy Expert communicates with the manager of the factory to which this particular cream is being sent, asking for a report as to the quality of the cream delivered subsequent to the instructor's visit. In 90 per cent. of the cases this report is to the effect that the cream has been permanently lifted from second grade to choicest. In those few instances where no improvement is made or where, after a transient uplift in quality, the cream has lapsed to its old grade, the instructor is advised and proceeds as soon as possible to give further instruction at that farm.

The set of forms on page 853 was actually sent out by one of the present writers in one particular case, and the reader will gather the facts and the results of the procedure from their perusal.

So satisfied are factory managers with the results of this system that the applications for instruction to dairy farmers in this direction are far greater than the staff of the Dairy Branch can cope with.

Urgent Need to Eradicate Second-grade Cream.

It is of the utmost importance that the raw material produced on the farms should be of the highest quality. Every can of second-class cream delivered at a factory means loss not only to the farmer concerned, but also to the factory and the dairying industry of Australia generally. Quite apart from the necessity of marketing overseas only choicest grade butter, the ever increasing and incessant demand of the local Australian market for the highest grade products only is being found harder to meet each year. New South Wales has the advantage of possessing the greatest local trade in dairy produce of any State in the Commonwealth, and this trade is increasing in volume at a far greater rate than production. This is demonstrated by a comparison of the figures for the peak-production years 1921–22 and 1924–25. During the former period the total production of butter in New South Wales was roughly 100,000,000 lb. Imports from other States and New Zealand, amounted to 4,000,000 lb., making a total available for distribution of 104,000,000 lb. Of this total 67,500,000 lb. were disposed of within Australia, 36,000,000 being exported overseas.

For the year 1924–25 the total production amounted to 117,000,000 lb., imports from other States to 3,250,000, and the total amount available for distribution was 120,250,000 lb. This is the greatest amount ever produced since the dairying industry was established in New South Wales. Out of this quantity 44,250,000 lb. were exported overseas, and 76,000,000 were disposed of within Australia. Taking the three years mentioned, the increase in local trade is thus seen to be 8,500,000 lb. in the third year; that is to say, there is an annual increase in consumption of choicest grade butter by the local market of not less than 3,000,000 lb., and this increase must become greater as the population becomes larger each year.

Dairy Farm Instruction.

IMPROVING CREAM QUALITY.

No. 1.—Hunter River Valley District.

L. T. MACINNES, Dairy Expert, H. P. CHAPMAN, H.D.A., Senior Dairy Instructor, and C. S. KENTWELL, Dairy Instructor.

THE policy of the Department of Agriculture in giving instruction to dairy farmers who supply inferior milk and cream to registered dairy produce factories to be manufactured into butter, cheese, condensed or concentrated milk, has given general satisfaction to those who have had experience of the work of the field staff of the Dairy Branch, and it is proposed to give some account of the actual experiences and data collected by dairy instructors. The present is therefore the first of several articles of that kind.

For the purpose of the work of the Dairy Branch that portion of the State wherein dairying operations are carried on extensively has been divided into a number of districts. Of these there are at present eight, but it is hoped that the number will be increased as suitable staff and finance permit.

Each of the districts is placed in charge of a Senior Dairy Instructor, who is given subordinate officers to supervise and advise on the operations connected with the manufacture of dairy produce, the improvement of the raw material produced on the farm, the carrying out of the provisions of the Dairy Industry Act, and the improvement of the methods of breeding and feeding stock, especially in regard to the formation of herd-testing units, which are operated under the control of the senior officer.

In regard to the raw material produced on dairy farms, the practice is for the dairy instructors to visit the factories and examine and grade the milk or cream delivered by the suppliers. Where this is found to be of inferior quality, a fuller investigation is made, often entailing the use of the microscope and the making of a bacteriological plate. Having obtained all the information possible at the factory in connection with inferior cream supplied by a farmer, the instructor then visits the farm in question and closely inspects the dairy premises and surroundings, and, if necessary, the herd.

The investigations already made at the factory have given some indication as to where to look for the cause of the trouble. This is invariably located, and the farmer is advised how to remedy the defect in his cream. The instructor verbally gives advice on the care necessary to produce a choicest article, and on return to his headquarters he writes out a statement in triplicate, one copy of which is sent to the farmer, and the second to the Dairy Expert, Sydney, while the third copy is kept by the senior dairy

Notes on Varieties.

No. 22 Barley.—An early-maturing barley produced at Cowra. About five days earlier than Skinless and fourteen days earlier than Cape. Average height about 2 feet. Badly attacked by leaf scald.

Skinless and Cape Barley.—Both badly scalded, and about 10 per cent. heads affected with loose smut.

Delano Field Peas.—Earliest-maturing variety of peas tried, producing good bulk of fodder. Being fit to cut at the time Sunrise oats is ready for the pit, it may be of use in providing a silage of higher feeding value than oats alone, while the stubble should be useful as a soil renovator if ploughed in.

Slav Rye.—Germination of these plots was very poor, and consequently growth was very coarse. The crops grew to a height of 5 ft. 6 in., but were not at all succulent.

YIELDS of Various Crops and Mixtures.

Crops and Mixtures.	Seed per acre.	Yield per acre (Average of three plots).			
		t.	c.	q.	lb.
Sunrise oats	58 lb.	5	6	4	9
Sunrise oats and Delano field peas	49 and 45 lb.	5	1	3	2
Sunrise oats and French Grey field peas	49 and 45 lb.	4	16	2	22
Cape barley	55 lb.	4	11	3	22
Skinless barley	45 lb.	4	8	2	8
No. 22 barley	55 lb.	4	7	3	22
Sunrise and Farnham peas	49 and 45 lb.	4	7	2	26
Gresley wheat	66 lb.	3	17	2	10
Slav rye	45 lb.	3	16	3	24
Clarendon wheat	66 lb.	3	12	4	24
Gresley and French Grey field peas	58 and 45 lb.	3	6	0	15

THE ADVANTAGES OF SOILING.

SOILING—that is, cutting the green crop and feeding it to stock—is far more economical than pasturing for all kinds of live stock. Animals grazing on lucerne generally destroy far more than they eat by trampling down the fodder. Various estimates are given of the increased number of animals which can be carried on a given area by this method, several authorities stating that from three to six times as many head of stock may be maintained by soiling as compared with grazing. The advantages claimed for soiling over grazing may be summed up thus:—

1. It saves land.
2. It saves fencing.
3. It economises food.
4. It keeps cattle in better condition and greater comfort.
5. It produces more milk.
6. It increases the quantity and quality of manure.
7. There is greater docility and discipline of animals.
8. There is less breaking of fences.
9. It ensures regularity of feeding and output.

Crops for Silage.

TRIALS AT CONDOBOLIN EXPERIMENT FARM.

F. MATTHEWS, H.D.A., Experimentalist.

THE trial inaugurated in 1924 to ascertain the crop or crop mixtures most suitable for the making of silage in this district was continued this year, and on the two years' results it is safe to recommend the use of oats, preferably Sunrise, for this purpose. It produces a good bulk of succulent fodder, is early maturing, and is practically immune to those diseases common to wheat and barley.

Early varieties of field peas were tried in conjunction with wheat and oats, but were not very satisfactory, resulting in every case in diminished yields as compared with the cereal sown alone. A small portion of a Sunrise oats and Delano field pea plot, inoculated with soil which grew field peas in 1924, gave a somewhat heavier growth of peas, and it will be interesting to carry out a further test next year. The crops tried were—Sunrise oats, alone and in conjunction with Delano, Farnham, and French Grey field peas; Gresley wheat, alone and in conjunction with French Grey field peas; Slav rye, Clarendon wheat, and No. 22, Cape and Skinless barleys.

The soil was fairly typical, perhaps more inclined to fineness than the average of the district, owing to the percentage of clay present. The paddock was disc-cultivated 4½ inches deep in June, 1924, springtoothed 3 inches deep in September and October, disced again 3 inches deep in December, and springtoothed 2½ inches deep in February. The use of the disc cultivator in December was not desirable, owing to the fineness of the mulch, but as the area was not fenced in, sheep could not be made use of to keep the fallow clean. The resulting seed-bed at sowing time, although well consolidated at a depth of 2½ inches, did not hold moisture until about 9 inches down, the surface mulch being rather fine and shallow, allowing evaporation to take place. The rainfall on the fallow was 16·8 inches, and on the crop 9·23 inches. The balance of the rain on the growing crop fell in May and June, resulting in a delayed germination and a quick maturing of the varieties in the early spring.

The plots (measuring 1–30th acre each) were sown in triplicate on 2nd April, 1925, with a uniform application of 75 lb. superphosphate per acre. Germination, with the exception of the rye plots, was good, but somewhat delayed on account of the dry autumn. Fair growth was made throughout the growing period, but none of the varieties stooled to any extent. The plots were harvested on 8th October, with the results shown on next page.

Relation of Labour to Production.

The application of the law of diminishing returns to the use of capital has been well illustrated above. It is hardly necessary to add that the same principles apply equally well to the utilisation of labour in the farming business. An example is provided by the information conveyed by the chart (Fig. 9), which shows that the hours of man labour and horse labour per cow increased only slightly with high producing cows, while the hours per 100 lb. of milk (directly affecting cost of production) decreased very considerably as the production per cow increased.

A farmer who is fattening animals for market should remember that it is the last few pounds which are the most expensive to produce, and that he may easily spend much more than he obtains in getting up the final finish of the animal.

Conclusion.

It is obvious then that the production of farm commodities is subjected to the law of diminishing returns, which means, in effect, that the cost of securing an increase in production should not exceed the value of the increase so obtained.

A full comprehension of the principles underlying this law may be useful in determining the profitableness or otherwise of farm businesses, and enable the farmer to decide as to the advisability of changing over from one enterprise to another, as from beef to dairy cattle, wheat to sheep, and so on*.

* Since the above was sent to the Editor, there has come into the writer's hands (July, 1925), through the courtesy of Mr. H. H. Bentley, Secretary of the Queensland Council of Agriculture, a copy of a small book "The Law of Diminishing Returns," by Spillman and Lang. Those interested in the subject should obtain the book.—E.A.S.

When Examining Wool on the Sheep.

The main object when inspecting wool on the sheep is to open it without crushing the staples, and at the same time to expose it so as to allow a thorough inspection as to type and quality. There are many people who cannot open and inspect the wool properly. The general fault is that instead of opening it up with the fingers they dig them into the fleece, crushing the staples in all directions, and making it impossible for the wool to show in its most natural state.

When opening up the fleece (says Mr. Hugh McCallum, in the *Journal* of the Department of Agriculture, Western Australia), guard against pressure being brought to bear on the wool. Use the thumb and first and second fingers of both hands as spreaders; this is done by dividing the wool, not pressing, but opening out, keeping the staples straight while laying them down.

Lambs make much more economical gains than do older sheep, as is evidenced by the following figures from Henry and Morrison's "Feeds and Feeding" (abridged, 1919 edition, page 324) :—

	Feed supplied per 100 lb. Gain.	
	Barley. lb.	Clover Hay. lb.
Lambs	253	763
One-year-old wethers	256	1,413
Two-year-old wethers	248	1,469
Aged ewes	387	1,320

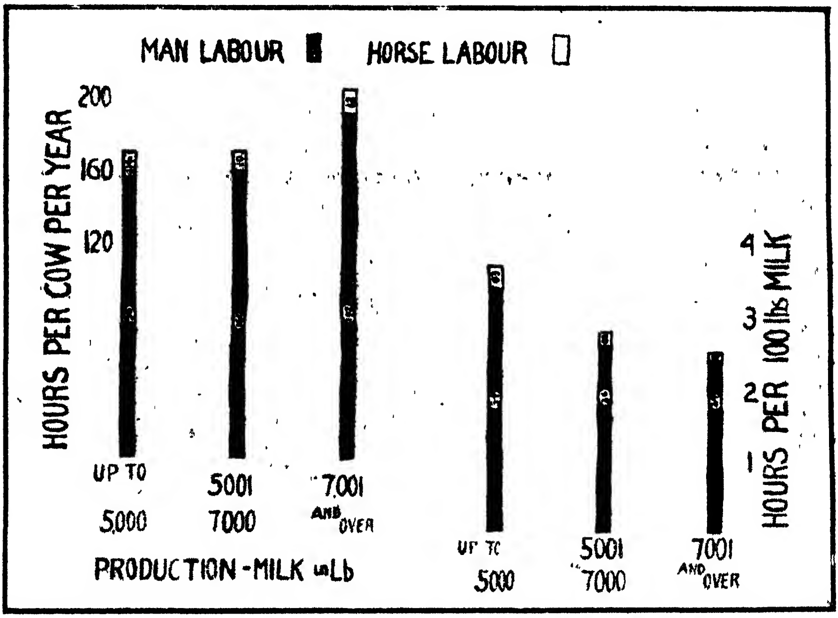


Fig. 9.—Relation of Labour to Milk Production at successive stages.

The following summarised data from the *Journal of the Department of Agriculture of Victoria*, November, 1924, pages 701–2, refer to the cost of production of pigs :—

Period.	Live Weight.	Cost for Period.	Cost (pence). Per day.	Per lb. Gain.
	lb.	s. d.		
First (31 days) ...	19·25	3 2	1·226	1·97
Second (35 days) ...	41·66	4 2	1·429	2·23
Third (32 days) ...	66·86	5 8	2·125	2·70
Fourth (38 days) ...	111·13	12 0	3·789	3·25
Fifth (34 days) ...	153·47	16 2	5·706	4·59

(2) the gains in weight from the third to the fourth year are relatively small, resulting in a high cost per pound of gain;

(3) the cheapest gains were made during the second year of the life of the animal.

Each pound of gain in the fourth year cost 20·2 cents compared with a cost of 6·1 cents in the second year and 7·4 cents in the third year.

Although no local figures are available, it is safe to predict that cost of production studies would show a similar series of figures for Australia, which would emphasise the necessity for early marketing.

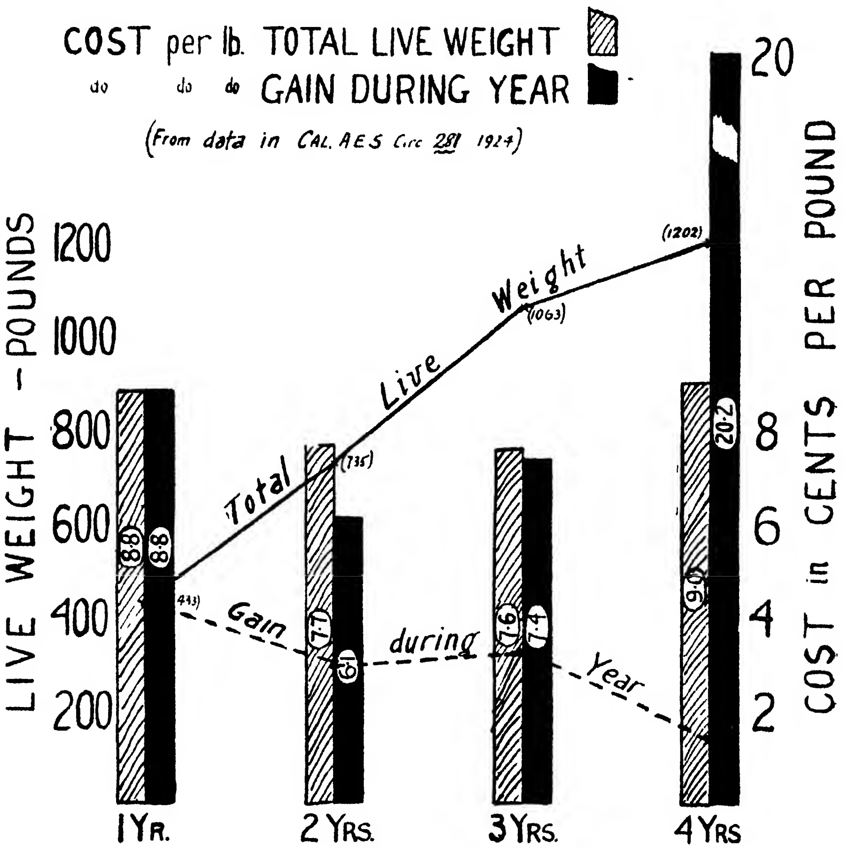


Fig. 8.—Cost of producing Beef in California.

In the case of beef cattle again, Henry and Morrison show feed cost per 100 lb. gain as follows:—Calves 7·74 dollars, yearlings 9·09 dollars, two-year-olds 9·37 dollars.

weight of food was more effective in producing live weight in the earlier than in the later stages of fattening. For example, they showed from experiments that in the case of pigs fattened to ten weeks—

During the first month 4 lb. of food were required to give 1 lb. increase in live weight.
During the second month 5 lb. of food were required to give 1 lb. increase in live weight.
During the last fortnight 6¼ lb. of food were required to give 1 lb. increase in live weight.

This was also demonstrated in connection with poultry (see U.S.D.A. Bulletin, No. 657, 1918) where it was found that to get an additional pound of live weight at four days old 8·21 lb of feed must be consumed, whereas at fourteen days old 8·88 lb. of feed was required.

Further American data show that feeding costs increase per chick per month as follows:—First month, 5 cents; second month, 8 cents; third month, 11 cents; fourth month, 14 cents; fifth month, 17 cents.

The relation between age and cost of production of beef cattle is illustrated in the Federal Trade Commission (U.S.A.) Report, 1920, in the following table:—

		dollars.
Cost of calf at weaning time (eight months)...	=	51·15
Cost of steer at twenty months	=	73·09
Cost of steer at thirty-two months	=	97·67

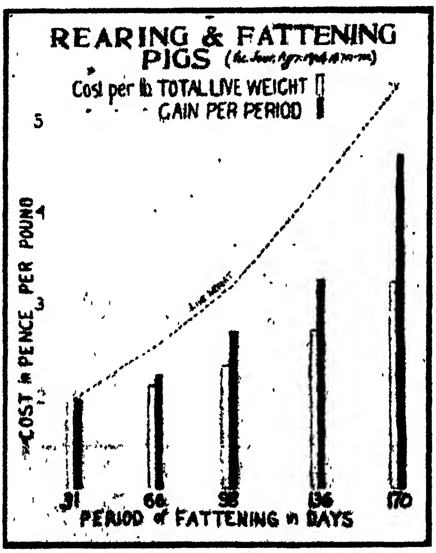


Fig. 7.—Cost of Gain in Live Weight in Pigs.

A recent survey to determine the cost of producing beef in California (see California Agricultural Experiment Station Circular No. 281, 1924) presents some striking figures, some of which are included in Fig. 8, which shows that—

(1) after weaning each succeeding year results in an increasing cost of feeding a beef animal;

of Victoria, January, 1924, pp. 37–42) form interesting examples of the law of diminishing returns. In a "rate and frequency of irrigation" trial, the averages of two seasons worked out thus:—

Applications of Irrigation Water.	Yield of Lucerne Hay.	Increase due to Irrigation.
	cwt.	cwt.
Rainfall only (17·95 inches)	29·7	......
Rain plus three applications of 6 inches...	111·0	81·3
Rain plus four applications of 6 inches...	134·4	104·7
Rain plus five applications of 6 inches...	148·6	118·9
Rain plus six applications of 6 inches ...	153·1	123·4
Rain plus eight applications of 6 inches...	165·5	135·8

Obviously, the first three applications of water greatly influenced the yield, and almost as beneficial was the fourth irrigation, but after that the advantage diminished with each watering.

Feeding for Milk and Butter-fat Production.

Dairy-farmers are much affected by this same principle. Low production, either because of poor cows or of scant feeding, usually requires more feed per unit of product than does higher production. On the other hand, while high production is desirable, the last few pounds of milk or butter-fat may cost too much, as instanced by Holtsmark, Norway, with the following figures from 846 herds:—

Number of Feed Units consumed per cow.	Yield of Milk per cow.	Yield of Milk per 100 Feed Units.	Number of Feed Units consumed per cow.	Yield of Milk per cow.	Yield of Milk per 100 Feed Units.
	Kilog.	Kilog.		Kilog.	Kilog.
1,500	923	61·5	3,500	2,399	68·5
2,000	1,424	71·2	4,000	2,632	65·8
2,500	1,813	72·5	4,500	2,837	63·1
3,000	2,131	71·0			

The relation between yield per cow and feed cost of milk and butter-fat, based on returns from 443 farms in the United States of America, is well shown in the graphs on page 843. Fig. 5 shows that 300 lb. of butter-fat is produced with appreciable economy compared with 100 lb. or 200 lb., but beyond 500 lb. the additional feed appeared unlikely to be profitable. Similarly in Fig. 6, the cost of feed per 100 lb. of milk is shown to decrease rapidly as the production increased, up to about 6,500 lb.; beyond that the difference was not so attractive to the farmers.

The Most Profitable Fattening of Live-stock.

The operation of the same law must be observed by men whose product is fat stock of any kind. Lawes and Gilbert emphasised the fact that a given

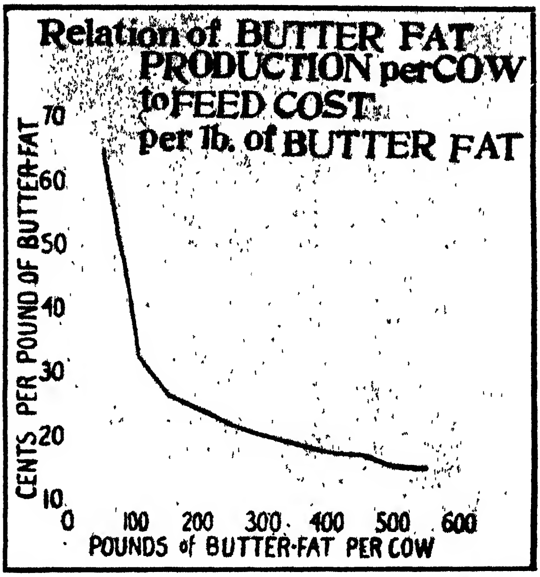


Fig. 5.—Yield of Butter-fat in relation to Cost of Feeding.

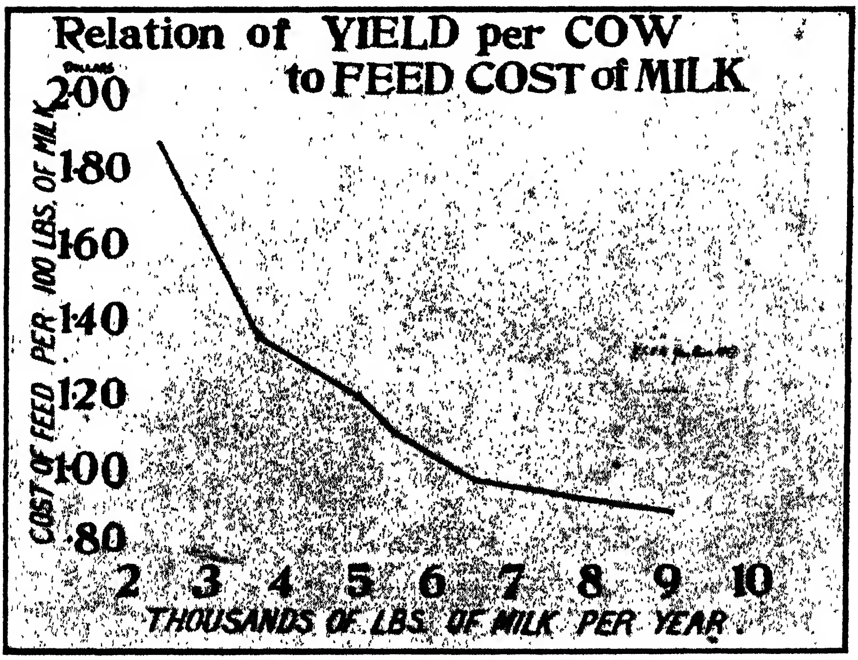


Fig. 6—Yield of Milk in relation to Cost of Feeding.

The work of growing and curing tobacco, though continuous, is not heavy. In one case a man employed on wages not far from his home planted a couple of acres, and then found he could not give it all the attention necessary. His wife, however, took a hand, and with the assistance of a couple of children kept the crop growing and finally harvested the leaf. With his assistance and direction she was also largely responsible for the curing, and was a decidedly interested party when the buyers put a value on the line that represented something round £170 or £180. The crop was well grown and satisfactorily cured, but it did not open up quite as well as might have been expected. Had it been bulked under better conditions the price would have been even higher.

Three or four cases were met with where the return per acre ran from £75 to £100, and in a case where 8 acres had been planted and only 4 could be harvested (one of two share-farmers failing to carry on), the return was nearly £40 per acre over the whole area, and that in an adverse season! A bad outbreak of mould in the district two seasons ago still left one grower £29 per acre over the area planted. Assuredly the crop has its attractions, and the industrious man with some capacity for painstaking detail, whose circumstances will allow him to wait for the money, can do well. One immigrant who has had a series of losses since arrival in the country, largely rehabilitated his fortune last season from 4 acres.

Reference has been made to the general inadequacy of the bulking sheds, but the same cannot be said as to the curing barns. These are almost invariably very suitable structures, rough logs plastered up with clay being preferred. Often the side of a hill is chosen as the site, the furnaces being situated on the lower side and the heat led in and round the floor in deep channels covered by galvanised iron, until the chimney is reached; in such barns the lifting of the leaf into position for the curing is minimised by most of it being carried into the barn at the back on the higher level. The roof is generally of iron lined with some rubberised material and everywhere crevices, through which heat might escape, are plastered up with clay. These structures are not expensive, £80 to £100 being an outside price for a fair amount of space, but where timber can be conveniently obtained and wages have not to be paid out, £25 to £30 would probably provide all the material required. One barn was seen where rough slabs had been used, and evidently with success, for the barn had stood for some years.

The danger as to fire is evidently pretty high, for two or three barns had been carried off during the past season, even among the few growers of the Upper Murray, but the admissions of at least two growers indicated that such catastrophies are often preventable, a little care, and the repair of any defect in the flues immediately it is observed being sufficient to prevent fire. There certainly should be no carelessness about fires in a building worth nearly £100, and containing perhaps £60 or £80 worth of crop, the whole in a highly inflammable condition.

A Review of the Orange-growing Position.

R. J. BENTON, Fruit Instructor.

THE very low returns received for citrus fruits marketed during the season just ending have been little short of disastrous to many growers. Not only were returns frequently barely sufficient to cover expenses, but the general disappointment resulted in many hundreds of cases not being picked from the trees. Returns have probably never been so low, which state of affairs compels attention.

Since the war prices have been higher than formerly, and owing to the very light crop, very high prices were obtained in 1924, but this season, owing to a heavy crop and increased areas coming into bearing, returns have receded to a level lower than perhaps ever before. Such low returns appear likely to be but the commencement of several lean years, unless the position is generally acknowledged and steps taken to meet it.

Oranges are usually divided into four classes, viz., Navels, Valencias, Commons, and Sevilles. The last, though partially absorbed by factories, are unprofitable to many growers, and are excluded from this discussion.

According to the 1923 census, oranges classed as stated above are planted in the following areas in New South Wales:—Navels, 4,600 acres; Valencias, 6,000 acres; Commons, 5,400 acres; lemons, mandarins, Sevilles, &c., 9,000 acres. For a number of years the Department of Agriculture has advocated the planting of Washington Navels and Valencia Late oranges, as the excellent qualities of these varieties were so manifest. It is gratifying to note that the majority of the trees planted since that time have been of those varieties. But in the period preceding those plantings, common oranges were almost exclusively grown. Until recently the oranges planted found a more or less profitable market in the local and interstate trade, but such markets have almost disappeared. In fact, several States besides New South Wales are now faced with a surplus.

The Navel orange, on account of its attractive appearance, size, and freedom from seeds, is now king of the oranges during its season, and the area of this variety is sufficient to completely supply this State's own requirements. A serious position confronts the grower of Common oranges, especially when it is realised that over 1,500 acres of Navels were in 1923 not in bearing.

The Navel orange season certainly is not very extended, the bulk of the crop being off in September. The Valencia Late orange is immediately ready for market in many districts, however, and having such excellent qualities as "holding for a long time" and containing few seeds, there is only a very short period, if any, available for the sale of the plentiful

Common orange. Besides, the Common orange season, generally speaking, is also really ended about the time of the Navel orange season. What, then, is to be done?

Before making any suggestions a little must be said about the Common oranges. There are over 5,400 acres under this heading, of which the one-time popular Parramatta comprises over half. The latter are fairly thick-skinned, contain many seeds, and the fruit itself is not very attractive in appearance. As a variety it is really out of date, and further plantings should not be made, as it has no outstanding qualities beyond heavy and regular cropping to recommend it, or to enable it to compete with the new and improved varieties.

These remarks also apply to the Jaffa, Holdfast, St. Michael, and other such varieties.

Some strains of Joppa (not Jaffa), Silettas, and certain seedlings, however, possess very good qualities in appearance, size, juiciness, and limited numbers of seeds, which should enable them to be grown profitably. Unfortunately, there are not many of these good quality Common oranges to be found, the great bulk of the Commons being of the coarse-skinned, seedy, unattractive type—the unprofitable kind.

While speaking of the inferior qualities of oranges, it must not be overlooked that a percentage of both Navels and Valencia oranges need attention in regard to improvement in quality. Some of these oranges, too, do not bear the quality which is profitable, being too rough in the skin, with an over-abundance of rag, and lacking in juice.

Now, if the trees are not of the best varieties or of very good type, it surely is apparent that there should be no more time wasted on them, nor should further expense be incurred in allowing such non-payable types to eat up expenses.

Trees that are not too old and still vigorous must be reworked to good types. If the trees are too old for reworking, but are still in good heart, they must receive the best cultivation, food, and care.

Pests and diseases, if in evidence, must be eradicated by spraying or fumigation, and pruning should be conducted when necessary.

If trees are not worth this expense and care, they should be dug out. Unprofitable trees should no longer be tolerated to handicap the grower. It is a hard and disappointing position to face, but it is less discouraging than "keeping" the trees year after year, hoping against hope that sales might improve.

An excellent plan for each citrus grower is to take stock of his bearing trees each season before commencing to harvest. The crop on each tree should be estimated, the quality noted, and a careful record made of each tree's performance. After a few seasons' records the poor bearing trees and fruit of inferior type can be definitely located, as also the good bearing trees. By reworking the more or less unprofitable trees with the type of the good tree the standard of fruit produced will be gradually raised. The recording

of the individual performances of trees does not take very much time, and a great deal of benefit will result from this procedure, as careful attention towards producing an even standard of quality is of the greatest assistance when marketing.

The business of producing oranges is now so keen that success depends entirely on quality. Every person eating a good quality orange naturally wishes to eat another, but if the quality is inferior each and every one knows the result—one orange is enough.

In the situation which has at last culminated in such poor returns, let us be frank, and determined to supply the public with varieties and qualities of oranges demanded.

Application of Knowledge in the Apiary.

The advice to the beginner in bee culture regarding the importance of commencing in a small way is sound, and too many have failed or had financial loss through not having followed this advice. There are inducements to commence in a large way, and in this regard we could take the man with some capital, who has made a good study of bee culture from text books, and who is, even without practical experience, able to discuss details of the business with experienced men. There is much inducement for this man to make a big start, not knowing to the full extent the wide difference between a knowledge of apiculture and its application. After gaining the knowledge, it would appear to him to be a reasonably easy matter to apply it, but such is not the case. To be successful, practical experience must be combined with study, for to speculate to any extent without this combination is to take a good deal of risk.

Here is an instance which is not uncommon: A large number of colonies are purchased during the spring by a man who has a good theoretical knowledge of apiculture. The bees are removed to a selected locality, and the apiarist commences operations. The bees are of poor breeding, and knowing that it is advisable to Italianise with young queens, queen-rearing is commenced, and owing to his eagerness, enthusiasm, and lack of experience, conditions are not just right for the work. The result is, a poor class of queen is raised, an excessive number are lost during the mating flights, and following on this a general decline in colony population takes place at a period when strength and vitality are required.

In another case the wrong period is selected for the making of artificial increase or for some other important operation, or the apiarist after a few failures becomes over-cautious, and misses the most favourable opportunity, which also means a loss to him. While it is easy to gain confidence by experience obtained gradually, or under the guidance of a good man, it is also easy in some cases for the beginner to lose confidence when rather extensive losses occur through lack of experience.

On the other hand, we find good, practical men working apiaries who have not made a study of modern works, and the wasteful methods they adopt amply illustrate the importance of the knowledge the books contain.—W. A. Goodacre, Senior Apiary Instructor.

Agricultural Seeds From Overseas.

EFFECT OF THE VOYAGE ON GERMINATION CAPACITY.

A. W. S. MOODIE, H.D.A., H.D.D., Assistant Agrostologist.

FROM tests, the results of which were published in the *Agricultural Gazette* of January, 1924, pp. 59–60, it appeared that seeds stored under fairly even and low temperature conditions germinated more uniformly than where samples had been subject to wide variations of temperature. Further experiments have since been carried out, the results of which seem to confirm the conclusions drawn from the first tests.

During October, 1923, parcels of seeds were forwarded to London from Sydney, and were tested for germination on arrival. During the voyage the following temperature conditions prevailed where the seeds were stored :—

Tank Room, 15 to 29 deg. Fah. The maximum temperature prevailed for one day only, while for thirty-two days out of forty-seven the temperature ranged between 20 and 25 deg. Fah. The minimum temperature lasted for two days, and for five days less than 20 deg. was recorded.

Store Room, 73 to 119 deg. Fah. High temperatures (100 to 119 deg.) prevailed for fifteen days, while for twenty-three days the thermometer ranged between 85 and 95 deg. Fah. Minimum and maximum temperatures occurred for one day in each case.

Cabin, 58 to 86 deg. Fah. Readings mostly varied between 60 and 82 deg. Fah. Extreme readings for one day only in each case.

The time of storage of the seeds was forty-seven days.

Germination tests, carried out on arrival of the seeds at London, gave the following results :—

Variety.	Test before leaving Sydney.	Tests on arrival at London. Kept in Tank Room, 15 to 29 deg. Fah.	Kept in Cabin, 58 to 86 deg. Fah.	Kept in Store Room, 73 to 119 deg. Fah.
	Per cent.	Per cent.	Per cent.	Per cent.
Sudan Grass (*Andropogon sorghum* var. *sudanensis*).	84	44	48	58
Sorghum (*Andropogon sorghum*)	88	68	57	67
Beet	158 sprouts.	122 sprouts.	130 sprouts.	135 sprouts.
Lucerne (*Medicago sativa*)	86	92 + 1	79 + 2	87 + 2
Cabbage	71	84	71	71

During August, 1924, seeds were conveyed from London by the "Esperance Bay," and tested on arrival at Sydney. During the voyage the following temperature conditions prevailed in the places where the seeds were stored :—

Tank Room, 22 to 34 deg. Fah. There were no sudden changes in temperature, all being gradual, minimum and maximum obtaining for one day only in each case.

Store Room, 71 to 122 deg. Fah. High temperatures (100 to 122 deg.) prevailed for twenty days, from 85 to 100 deg. for sixteen days, and below 85 deg. on sixteen days. Minimum and maximum temperatures prevailed for one day only in each case.

Cabin, 56 to 97 deg. Fah. Temperatures of 60 to 75 deg. prevailed on nineteen days; 75 to 90 deg. on twenty-seven days. Minimum and maximum temperatures for one day only in each case.

Time of storage, fifty-two days.

On arrival at Sydney tests were carried out with the following results :—

Variety.	Test before leaving London.	Tests on arrival at Sydney.		
		Kept in Tank Room, 22 to 34 deg. Fah.	Kept in Cabin, 56 to 97 deg. Fah.	Kept in Store Room, 71 to 122 deg Fah.
	Per cent.	Per cent.	Per cent.	Per cent.
Common or Plain-leaved Cress	98	100	96	98
Chewings Fescue (*Festuca rubra* var.)	83	73	27	50
Moss-curled Parsley	69	73	63	60
Lettuce	99	98	100	98
Cucumber	95	88	78	88

Both the foregoing tables show results slightly in favour of storage at low temperatures with little variation, as against higher temperatures with big variations. Curiously enough, the seed kept in the store, in which the temperature was highest and variability greatest, gave next best results to the cold storage.

The averages for fifteen tests were as follows :—

Tank Room ...	80 2 per cent.	Cabin	68·7 per cent.
Store Room ...	75·3 per cent.	Check tests ...	87 per cent.

Beet was excluded in computing the averages, as all sprouts were included in the count of this variety.

It appears from these tests that seeds stored under cool conditions with little temperature variation are likely to retain their viability better than when stored under warmer conditions with big variations in temperature.

It must be understood that, although it would appear from the averages given above that some deterioration may take place even under most favourable storage conditions, the seeds used for these tests were only small samples. Large consignments of seeds may be only affected to a slight extent round the outer edges of the bags. On the other hand, large consignments would probably be stored under less favourable conditions than any of the samples tested.

The Control of Fruit Fly.

W. B. GURNEY, B.Sc., Government Entomologist.

In giving some account of the methods which may be adopted for the control of fruit fly, it may be said at the outset that fruit flies are not a serious pest of citrus fruit in this State. It is found, as a result of close inquiry, that the loss of fruit from infestation rarely exceeds 1 per cent. Later in the season, as the fly increases, it becomes more serious in stone fruits.

The problem of fruit-fly control may be conveniently considered with reference to the four stages in the life of the insect, namely:—(1) The egg stage; (2) the larval or "maggot" stage; (3) the pupal stage; (4) the adult (winged) stage. By reviewing the life history we may perhaps arrive at the periods of development during which the fly is vulnerable: that is, when it may best be reduced by control measures.

(1) *The Egg Stage.*—No spray can be employed to reach the eggs, which are inserted into the fruit about one-fifth of an inch below the surface, nor have any egg parasites yet been discovered which might prove of value in control.

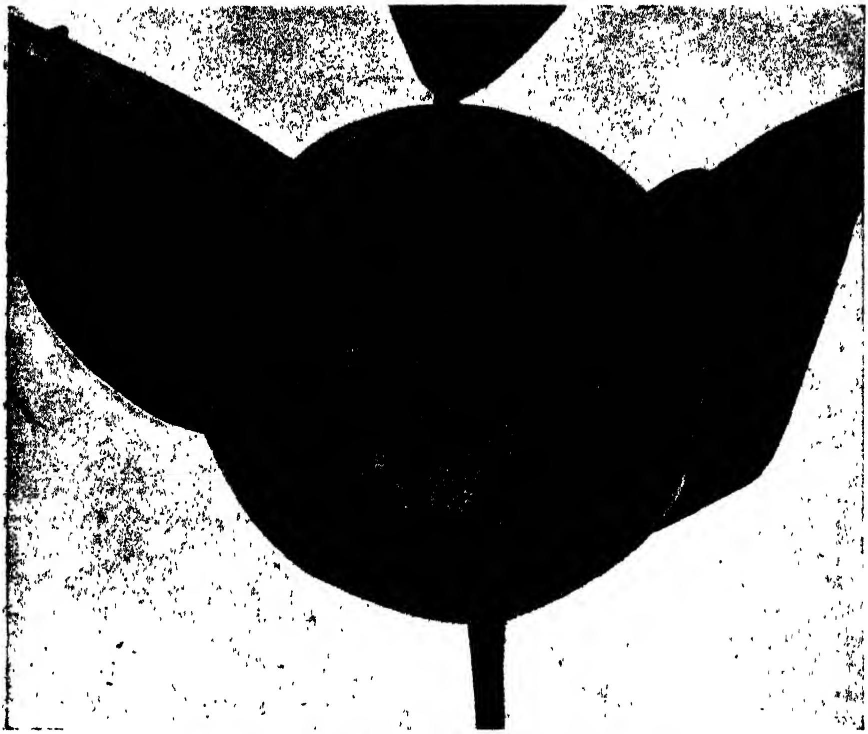
(2) *The Maggot Stage.*—Obviously the destruction of all infested fruit on the trees or on the ground will reduce infestation considerably, and requirements concerning burning, boiling, or otherwise destroying infested fruit are embodied in the regulations under the Plant Diseases Act. The use of fowls or pigs to destroy fallen or infested fruit is of incidental value, but neither practicable nor reliable enough for general adoption. Parasites of the maggot have so far not been successful in control, mainly owing to the fact that they fail to reach sufficient maggots when hidden in the large fleshy fruits of our orchards, however well they may infest the maggots in small wild fruits or berries.

Cold storage offers some possibilities as a palliative. The writer has already demonstrated in tests carried out two years ago that twenty days in cold storage at 34 to 35 deg. Fah. destroyed the fly maggots in fruit so treated. (*Agricultural Gazette*, July, 1923, page 528.) This is supported by experiments in Hawaii. A later experiment in South Africa, however, disclosed that under certain conditions the fly can survive as long as six weeks at 34 to 35 deg. Fah. This past year we endeavoured to obtain a quicker kill of the maggots by treatment of infested fruit for alternate three-day periods of cold storage at 34 to 35 deg. Fah., and normal temperature. This did not prove as effective as the continued cold for three weeks. It is proposed, however, to test contrasted temperatures with alternate periods of four or five days cold storage and normal temperatures.

(3) *The Pupal Stage.*—Control of the fly at this stage of its life history is linked up with data as to what percentage of flies tide over the winter as pupæ and what percentage as adult flies. Should a sufficient percentage

pass the winter as pupæ to warrant it, there may prove some advantage in paradichloro-benzine or other soil fumigants applied to the soil under the trees. This would only be warranted if the chief source of re-infestation the following season can be traced to the pupæ within the soil and not to adults overwintering.

(4) *The Adult Fly Stage.*—This is a vulnerable stage, during which the possibilities of control are various. In the first place, the attractiveness of various baits or "lures" in open vessels or in closed traps has been tested.



Mediterranean Fruit Fly (*Ceratitis capitata*). [Natural Size.]

The results of tests carried out by this branch and at Glen Innes Experiment Farm and Hawkesbury Agricultural College show that fruit juice or fruit juice plus treacle or molasses, pollard and water, Watson's specific, and Harvey's lure are among the most attractive baits. Citronella and other substances did not give such good results. Pollard bait proved very attractive to Mediterranean fruit fly, while Huon pine oil was particularly atractive to one variety of the Queensland fruit fly, known tentatively as *Dacus ferrugineus*, var. *solani*. If these "lures" are used in closed fly-traps, then no poison need be added, but where open saucers, tins, or other vessels are used, some poison (*e.g.*, white arsenic, arsenate of soda, lead arsenate, or calcium arsenate) must be used with the lure.

Foliage Poison Sprays.

Some of these lures with the poison added can be used also as foliage poison sprays, and a few ounces sprayed on to a small patch of the foliage of each tree. This attracts the flies to feed and they are poisoned, thus doing away with the use of traps, and the expense and labour of obtaining and hanging and refilling them at frequent intervals. There is, therefore, much to be said in favour of foliage poison sprays, as a cheaper and simpler method of poisoning the flies than the use of traps.

Last season I carried out experiments with the assistance of Messrs. M. A. Byrnes, J. Swan, and F. W. Stokes, Orchard Inspectors at Lower Portland, Cardiff, and Penrith respectively. A foliage poison spray, departmental formula, was used, and the results in two instances were so encouraging as to give hope that fly may be controlled if the amount of arsenate of lead is increased, or better, if arsenite of soda or calcium arsenate is employed in the bait, in order to give a quicker kill of the flies and thus reduce the pest before many of the flies can lay their eggs in the fruit. The experiments are summarised in the data given below:—

The departmental formula used was as follows:—

Lead arsenate	3 oz.
Molasses	4 lb.
Fruit syrup	8 pints.
Water...	24 pints.

(1) CARDIFF (E. Rowe's orchard), Peach—

Number of trees sprayed 34
,, ,, reserved for detailed examination 3
Six applications, at 7-day intervals, from 10-12-24 to 20-1-25.
Controls.—19 trees at J. Cockburn's orchard.
3 ,, reserved for detailed counts.

Results.—

Control—
Number of peaches examined 500
,, ,, infested 114
Percentage infested ... ... 22 per cent.

Trees sprayed—
Number of peaches examined 891
,, ,, infested 114
Percentage infested... ... . 12·7 per cent.

(2.) EMU PLAINS (Collier's orchard), Peach—

Number of trees sprayed 90
,, ,, reserved for detailed counts ... 10
Five applications between 10-12-24 and 14-1-25, at 7-day intervals.
Controls.—3 trees at Cattell's orchard.

Results.—

Control.—
Number of peaches examined 943
,, ,, infested 11
Percentage infested ... ... 1·16 per cent.

Trees sprayed—
Number of peaches examined 4,640
,, ,, infested 11
Percentage infested ... ... 0·24 per cent.

(3.) LOWER PORTLAND, Peach—

Number of trees sprayed 50

,, ,, reserved for detailed counts ... 5

,, applications—six at 7-day intervals, approximately from 10-12-24 to 22-1-25.

Controls.—5 unsprayed trees.

Results.—Practically as many infested among the sprayed trees as in the control.

The results from the experiments may be summarised as follows:—

At Emu Plains estimates were made from over 5,000 peaches taken from the three control and ten treated trees out of ninety sprayed. The result showed 1·16 per cent. infestation in the control trees, while only one-fifth of this quantity, viz., 0·24 per cent., were infested among the sprayed trees.

Again at Cardiff, Mr. Swan estimated from the examination of 1,400 peaches collected from treated and control trees that 22 per cent. were infested on the controls as against about one-half this number on the treated trees, viz., 12·7 per cent.

However, in a similar test at Lower Portland, Hawkesbury River, out of a large number of peaches examined, approximately the same percentage was infested in the treated as in the control trees. In this particular test the results were promising until about ten days before the experiment closed, when a sudden influx of Queensland fruit fly occurred, and this confirms the view that the bait was not toxic enough, and that the amount of lead arsenate should be increased.

The fruit juice, molasses, and arsenate of lead spray employed in the above experiments contained only 3 ounces of arsenate of lead powder to each 4 gallons of the spray. Laboratory tests carried out by my assistant, Mr. T. McCarthy, indicated that at this strength the adult flies could not be killed when fed on the bait in less than two or three days. It is therefore recommended that the quantity of arsenate of lead for foliage spraying be increased as indicated in the following formula:—

Fruit juice (extracted from 4½ lb. of fruit—about twelve oranges or eighteen peaches).

Molasses, 4 lb.

*Arsenate of lead powder, 5 oz. (or 8 oz. arsenate of lead paste).

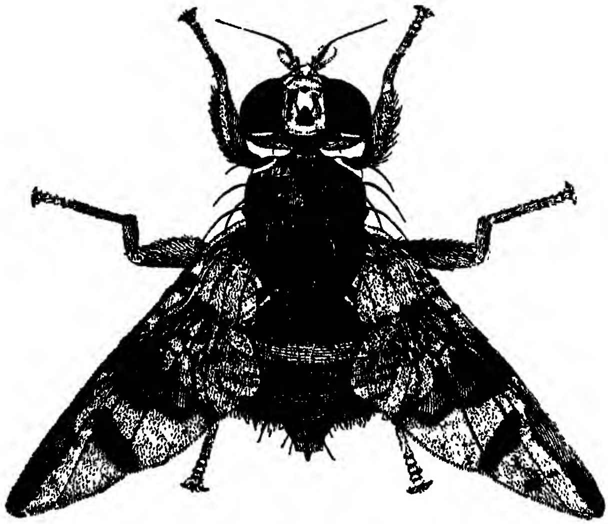
4 gallons of water.

The fresh juice squeezed out of the fruit is preferable, or the fruit may be cut up somewhat and boiled for a few minutes in some of the water. The spray should be stirred frequently during spraying in order to keep the arsenate well distributed in the mixture.

About 2 or 3 fluid ounces only of the spray should be applied to a small patch of the foliage of each tree, once a week for a period of four to eight weeks before the fruit ripens or is harvested.

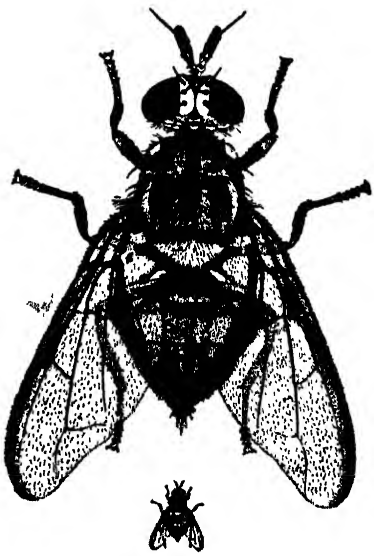
*In lieu of the lead arsenate, 3 oz. of calcium arsenate or ½ oz. arsenite of soda are being tested.

Mr. McCarthy's experiments on the toxicity of various poison sprays to fruit flies indicated that arsenite of soda and calcium arsenate were more toxic than lead arsenate, the arsenite killing in about half an hour and the calcium arsenate in about forty hours after the flies fed on it, whereas, the arsenate of lead was only fatal after several days.



The "Common" or "Mediterranean Fruit-fly." [Enlarged]

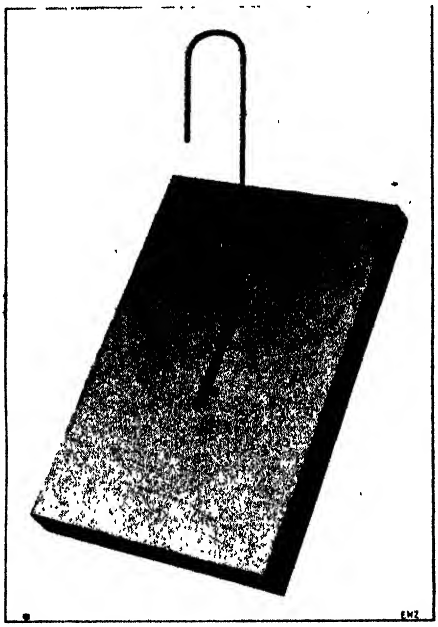
Fruit-fly Maggot.



Queensland Fruit-fly.

It would seem advisable, therefore, to use arsenite of soda or calcium arsenate in small enough doses not to burn the foliage and yet to give a quicker kill than the arsenate of lead. Tests will, therefore, be made this season with one-sixth ounce to one-third of arsenite of soda, and with 3 ounces calcium arsenate to 4 gallons of the spray, in lieu of the arsenate of lead.

During last season's experiments the foliage poison spray was found sometimes to spot the fruit of peach trees, unless it was carefully applied so as only to wet the foliage. To obviate this possible spotting of the fruit and to do away with the need of a pump, and reduce the labour of



Painted Board about 10 inches by 2 feet for Dipping in Poison Spray.
Note wire hook for hanging the board on the tree.

applying the spray to the foliage, it is being arranged to use this foliage spray mixture on painted boards. Boards about 2 feet by 10 inches are to be dipped into a petrol tin containing the poison mixture, and one board hung horizontally by a wire to a limb on each tree. The boards would need to be redipped and rehung once a week.

If this method proves effective under field conditions it will do away with the need for a spray pump, and considerably lessen the labour and expense of applying this bait. Unpainted boards were found to absorb the poison bait and lead to too rapid drying; hence the need for painting the boards. A further advantage of this method of using the poison bait is that we can use sodium arsenite at the greatly increased strength of

$1\frac{1}{2}$ ounces per 4 gallons of spray, which, of course, is much more rapid in its effect upon the fly than the weaker strength at which the poison can be applied to the foliage.

Summary.—The whole of the results of last year's experiments point to foliage poison as likely to control fly successfully if the mixture is rendered more toxic by the increased quantity of lead arsenate, or preferably if arsenite of soda or calcium arsenate can be employed in effective doses without burning the foliage. Also, it seems likely two to four applications, three or four weeks before the fruit is harvested, will prove sufficient. The system of employing boards with the poison spray has yet to be proved.

"Lures" in Traps.

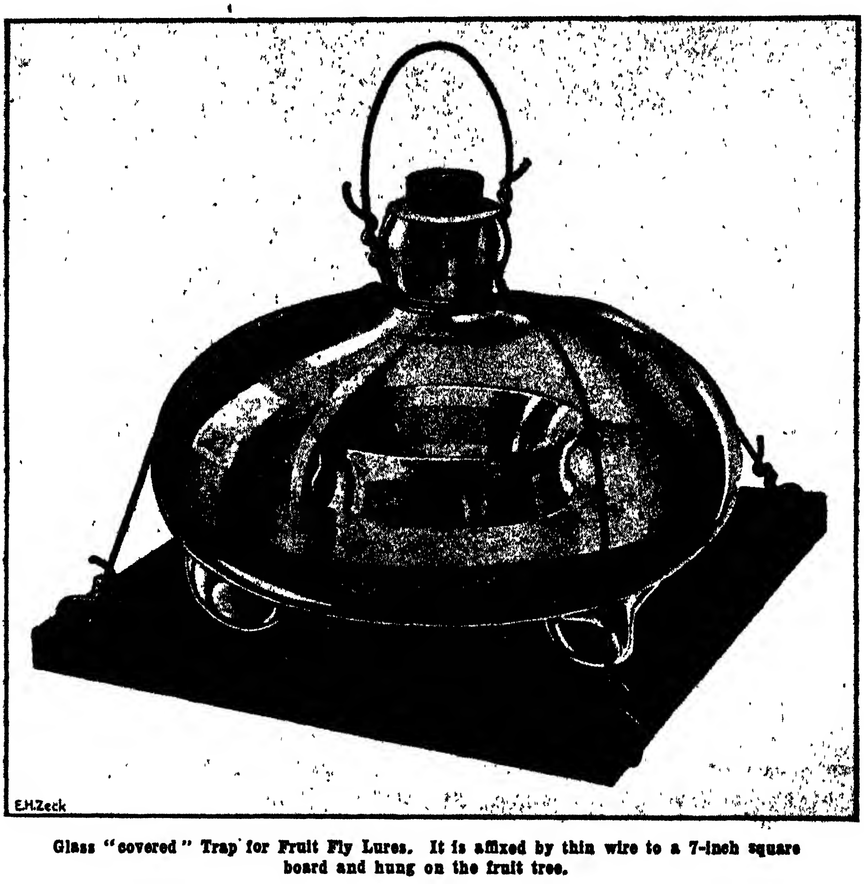
The departmental formula (fruit juice, molasses, and water), fruit juice alone, and Harvey's lure have given good results in attracting flies to the traps. The results at Hawkesbury Agricultural College suggested a reduction of fly over last year. Similarly Glen Innes Experiment Farm reports a reduction in fly which is attributed to trapping with Harvey's lure, but it must be pointed out the Mediterranean fly was less prevalent during the past season, and Queensland fly was not much in evidence till the latter half of the summer.

The results from the use of Harvey's lure in over 3,000 traps throughout the Stanthorpe district (Queensland) during the past summer were inquired into recently by Mr. W. J. Allen and myself when we visited the locality. Messrs. Jarvis and Perkins, the entomologists in the district, were of opinion that the results were erratic, many orchards being as badly infested as other orchards in which the lure had not been used. Some orchardists who used the lure in traps even suffered more than last year, when they had not used any traps, while others again claimed that the traps had reduced the fly. It was suggested, however, that whether the traps with Harvey's lure gave a slightly advantageous result or not, the use of the lure had not given satisfactory control of the fly in this district, and there had been considerable loss of fruit. It was also found at Stanthorpe that the marketing of all fruit and the destruction of all fallen fruit by 7th April in the previous year (1924) was not successful in eliminating the fly for the season following, viz., October, 1924, to April, 1925. This latter fact suggests to me that sufficient flies survived the winter as adults or pupæ to inaugurate infestation the following season. Messrs. Tryon, Jarvis, and Perkins consider there is possibly a migration of fly into Stanthorpe from the scrub or orchard districts outside the Stanthorpe area. Investigations of this possible spread from scrub in New South Wales to Stanthorpe, Queensland, are being carried out by this branch in co-operation with the entomologists at Stanthorpe.

Fruit Fly in Wild Fruits.

During 1908-9 I carried out investigations concerning fruit flies developing in wild fruits in the Gosford-Narara district, New South Wales. The results were published in the *Agricultural Gazette*, New South Wales,

1910-11, and the data brought together in *Farmers' Bulletin* No. 55, July, 1912. In this bulletin I proved that the Mediterranean fruit fly (*Ceratitis capitata*) does not develop in our wild fruits, and is therefore not spreading from them into our orchards as was feared by our growers. I then also stated: " It is noted here that the Queensland fruit flies bred in the Gosford-Narara and other coastal districts appear to be a distinct variety of the Queensland species (*Dacus Tryoni* [now *D. ferrugineus*]). We have



Glass "covered" Trap for Fruit Fly Lures. It is affixed by thin wire to a 7-inch square board and hung on the fruit tree.

developed some 18,000 specimens, and they are decidedly smaller and darker than the Queensland specimens." I reported, " The natural home of our variety of the Queensland fruit fly is the moist, dense scrubs of the eastern coast from Sydney north to Queensland," and that " while exceedingly plentiful in the scrub, only small numbers as a rule visit the orchards." I recorded them as attacking cheese-wood berries (*Acronychia laevis*) in September to November, in black apple or native plum (*Side-

roxylon australe) in November to February, in white ash berries (*Schizomeria ovata*) in February to April, in wild black fig (*Ficus stephanocarpa*) March to May, and in lillypilly berries (*Eugenia Smithii*) in October.

From further work by Messrs. Jarvis and Perkins at Stanthorpe, it seems likely that this variety of the Queensland fruit fly may prove to be a distinct species, and there may be several species attacking different wild fruits. Mr. Jarvis has tentatively referred to one variety as *Dacus ferrugineus,* var. *solani,* as it breeds commonly in solanum berries; another species *Dacus ferrugineus,* var *Jarvisi,* is a manuscript name applied to a species which Mr. Jarvis developed in other wild fruits. Therefore my investigations and subsequent observations indicate that the variety found in native wild fruits is distinct from the true Queensland fruit fly (*Dacus ferrugineus*), and does not develop in cultivated fruits.

Deterrents for Fruit Flies.

During the past summer we arranged tests at Glen Innes Experiment Farm as to the value of Bordeaux mixture as a deterrent of fruit fly attack. The manager of Glen Innes farm reports that Bordeaux mixture, 6-4-50, was applied approximately two months before harvesting, and a second application was given one month before harvesting, in accordance with recommendations. The experiment was carried out on Williams pears and every alternate tree was sprayed. Only seven infested fruit were found in the fifty-one cases from the treated trees, and thirty-three fly-infested fruit in the forty-eight cases from the untreated trees. The manager reports that applications of Bordeaux mixture therefore act as a deterrent. This supports results from the use of Bordeaux mixture last year. Further experiments on apple, pear, etc., are being continued this year.

Manuring of Orange Trees.

In the manuring of citrus trees in our coastal districts there is no doubt that it is necessary to supply nitrogen and phosphoric acid. Although there is not the same certainty about potash, experiments which are being conducted by the Department, while by no means conclusive yet, indicate that its addition is necessary to obtain the full capacity crop from orange trees and to keep up the size of the fruit on some of our coastal soils.—W. le Gay Brereton, Assistant Fruit Expert.

The Art of Agriculture.

Agriculture is an art, and it is an art that was practised centuries before the sciences were born with which it has become associated in modern times. Nevertheless, the farmer of to-day, working under modern conditions, cannot afford to neglect the teachings of science as far as they affect his own art; and that farmer will be the successful one who is able to understand what science has to tell him, and to utilise the weapons which she puts into his hands.

The Influence of the Mineral Constituents of Food on Animal Health.

MAX HENRY, M.R C.V.S., B.V.Sc., Chief Veterinary Surgeon.

In previous articles, (1) and (2)*, the author has attempted to bring home the importance of the mineral constituents of food in safeguarding animal health. Those articles were based chiefly on actual observation and experience in the field, but it is desired here to point out along what lines it has been otherwise demonstrated how absolutely essential is the supply of these materials in preventing loss from disease.

The two most important of these mineral constituents of the food are sodium chloride and calcium phosphate. It is not proposed to labour the importance of sodium chloride, since in the form of common salt it is almost universally supplied to live stock, and its value is well known.

It is necessary to touch more in detail on the subject of calcium phosphate. This salt is the most important by volume in the animal body, and generally speaking more than 80 per cent. of the ash in the animal body consists of phosphoric acid and lime in combination as calcium phosphate(3). The total ash of a fat ox has been estimated at 3·9 per cent. of the body weight, and of this 40 per cent. is phosphoric acid and 44·61 per cent. lime.

Milk contains ·75 per cent. ash, and of this 70·5 per cent. consists of calcium-phosphorus compounds, totalling approximately ·53 per cent. of the milk.

The greater quantity of the calcium phosphate of the body is found in the bones. Naturally, the amount of lime and phosphoric acid required by the young growing animals is comparatively much in excess of that required by an average adult. The pregnant female also requires a large amount of both salts—not only sufficient to supply her own needs, but also to build up the skeleton of the growing fœtus. The lactating female again needs an abundant supply, if the milk is to contain its proper proportion. When, as often is the case with the dairy cow, the animal is both pregnant and milking, it must be evident that the amount necessary is out of all proportion to that which suffices for a steer or other adult, which only requires sufficient to replace body waste. Such would be the case with an ordinary milking cow, but now that the milk production of the cow is being forced in a quite unnatural manner the supply essential to health increases correspondingly.

All this material, both lime and phosphoric acid, comes normally from the food supplied; that is to say, in this country chiefly from the pastures. It can only be present in the feed if it is in the soil in an available form.

* These figures refer throughout to the list of references on p. 894.

The quantities which are required may be gauged by the fact that the skeleton of a year-old calf contains on an average 7,700 g. (17 lb.) of lime, and 7,000 g. (15½ lb.) of phosphoric acid, and the daily addition required for its growing needs would be 21 g. lime and 19 g. phosphoric acid.[4]

From investigations carried out it has been deduced that animals require in their ordinary food about two to three times as much lime and phosphoric acid as they store in their bodies. Milk, however, is utilised to a higher degree.[5]

A cow requires about 30 to 35 lb. of calcium for body maintenance, from 10 to 15 lb. for development of the calf, and about 25 lb. for each 5,000 lb. of milk she produces.[6]

In order to supply these large amounts of mineral matter, it may be necessary to supplement that found in the pastures, or in the other feed supplied. All plants do not contain the same quantities, nor does any one plant consistently contain the same proportion. The quantity of mineral substances found in fodder plants depends not only upon the kind and size of the plant, but also upon the soil, manure, and weather. As a rule, a rich soil or the application of plenty of mineral manures raises the ash content of the plant. Periods of drought decrease the amount of mineral substances in the plant, particularly as regards lime and phosphoric acid.([7]) Just as these differences exist in plants so do they exist in soils. Thus Jensen ([8]) found in a series of soils taken from the South Coast that the proportion of lime (C_nO) varied from ·118 per cent. to ·616 per cent. and phosphoric acid (P_2O_5) from ·070 per cent. to ·152 per cent.

Calcium and phosphorus are both very important elements if the proper functioning of the body is to be maintained. Both are obviously essential for bone formation. In addition, calcium plays an important part in controlling the clotting of blood, in regulating the heart's action, determining the firmness of muscle, in assisting in the digestion of fat, and in controlling the action of other minerals on the body.

Phosphorus is essential for the building up of all the tissues of the body, and without it the supply of milk, wool, and meat would be impossible. It is also necessary for the proper functioning of the organs of the body, and appears to be somewhat intimately associated metabolically with the vitamines.

The disease conditions which may result from a deficiency of calcium and phosphorus may be grouped as those resulting from malformation of bone and those associated with a general decrease in tone and vigour.

In New South Wales the most obvious result of this deficiency is the osteomalacia so common on much of our coastal land, and which is now making its appearance, or is about to make its appearance, as indicated by the occurrence of bone chewing in fresh areas, not only on the coast, but inland. If present methods of farming and grazing are continued, osteo-malacia will continue to be found in wider and wider areas. Unthrifty cattle producing weak offsprings, giving a poor yield in milk, and unduly liable to fracture of

bones, are only too common a sight. Naturally the condition is aggravated when rabbits are numerous, or drought prevails, but at the bottom, lack of essential mineral salts is the cause.

Indirectly, this deficiency is responsible for many of the cases of botulism (dry bible, impaction of the omasum) in which the digestive tract becomes paralysed, since the lack of mineral matter induces the animals to eat bones, which may be infected with some variety of *Bacillus botulinus*, the causal organism of botulism.

Worm infestation and its evil effects are always more in evidence in insufficiently nourished animals, and the supply of good food grown in soils containing the necessary proportion of lime and phosphorus will go a long way to preventing such ill-effects. In an experiment carried out at Glen Innes it was found that ([9]) sheep on pastures laid down in superior grasses improved in condition without drenching more than the sheep in any group receiving medicinal treatment for worms, but on natural unimproved pastures.

There are strong indications that in some cases of paralysis in pigs this same deficiency is the responsible factor, and it is also intimately associated with rickets, although probably not the actual or only cause. (This must not be confused with the so-called rickets, commonly held to be due to eating burrawang, or zamia).

Serious as are the effects of the above-mentioned diseases, there is another source of loss due to the lack of calcium and phosphorus, to which so far sufficient attention has not been given in this country. This is the effect of calcium deficiency on reproduction. It has been found that feeding an animal continuously on the product of a single plant, such as wheat or oats, has a profound influence on the occurrence of oestrum ([10]) on satisfactory reproduction, and on the expulsion of the afterbirth ([11]). Again and again it was found that cows kept on a restricted diet, consisting of oat or wheat products only, produced premature calves, which were often born dead, or died soon after birth, and that the cows failed to "clean" properly. Hart and his co-workers in detailing one experiment determined that the critical factor was the mineral content of this ration (*i.e.*, corn, grain, and wheat straw), and the results serve to emphasise how important a factor the mineral side of a ration becomes to reproduction.

The interference with the normal occurrence of oestrum in cows may certainly be due to lack of mineral salts, and it is possible that at times the failure to conceive on the part of heavy milking cows may be due to the necessity for a rest and for building up, particularly in minerals. It has been noted that brood sows often become inactive as a result of insufficient mineral nutriment ([12]). The results of the addition of sufficient calcium to the feed of fowls was noted when a series of experiments were carried out in which various salts, such as calcium, magnesium, and strontium were fed, when three to four times as many eggs were obtained from hens fed the added calcium as from the other lots ([13].) Nor have observations been

lacking that in the human being as well, calcium bears a very important part in increasing fertility [14]. Naturally, in this regard the evidence is largely clinical, and based on individual cases rather than on set experiments.

It is evident, then, that a supply of calcium and phosphorus is all-important if many diseases are to be prevented, and if normal and satisfactory reproduction is to take place. If sufficient of these materials cannot be obtained from the natural pastures, then they must be otherwise supplied.

The natural pastures of many parts of Australia are deficient in both substances. Kincaid[15] speaks of the native vegetation of Victoria as characteristically poor in phosphorus. The close association of pastures deficient in lime and phosphorus with the occurrence of osteo-malacia has been definitely shown in New South Wales by Henry[16] and Jensen[17]. The soils in many districts, particularly on the coast, were in the first place low in lime and phosphorus content, and it would appear that when present the phosphorus was at times unavailable as plant-food.

When land already poor in these mineral constituents is grazed continually, particularly with milking cattle, the original calcium and phosphorus is removed from the soil in large quantities. It is only necessary to consider the amount sent away in the milk to realise this. Unless that calcium and phosphorus are replaced in the soil in some way, there must eventually come a time when the land will not be able properly to carry anything like the number of stock that could be placed on the same area when the land was first settled. For generations now the coastal lands have been grazed by milking cows, and nothing has ever been put back to replace the loss occasioned through the despatch of milk from the farm. Such a loss never occurs in a state of nature, since an animal only produces sufficient milk to nourish its offspring. All the animals die on the land, and their mineral constituents go back into the soil. Nothing actually leaves the land. The evolution of the present day heavy milking cow has completely upset this balance. In older countries where land is dear and holdings small, the necessity of properly conserving the nutritive qualities of the soil is fully recognised. Wallace[18] goes so far as to say, "The great function of live stock on a farm is not the making of so much profit . . . , but (*a*) the formation of a home demand for the crude, bulky, and unmarketable farm produce, and (*b*) *the making of farmyard manure to maintain the fertility of the land.*"

Osteo-malacia as we see it in this country is practically unknown in Great Britain, where the proper fertilisation of the soil is understood. The feeding of stock is carried out not only to fatten the animals themselves, but is deliberately considered with a view to increasing the value of the manure obtained.

That this removal is an actuality, and that its replacement is of vital importance, is known theoretically to everyone, but Whitson and Stoddart have taken steps to show definitely what quantity may be removed, and in detailing their experimental work[19] they say, "While the number of samples so far studied are too small to be made the basis of final conclusion on this

matter, it is evident that the loss of phosphoric anhydride under conditions of constant cropping and no return is largely caused by the removal of the crops, and this may amount to 30 per cent. of the total quantity contained in the soil originally."

As Kellner(20) has pointed out, where the soil is deficient in lime and phosphoric acid, and this deficiency is not made good by manures, the bones may become permanently brittle, for the fodder plants are not able to take up a sufficient quantity of mineral substances for the requirements of the animal. These matters are removed just as surely by grazing as by cropping, though the process would be slower.

It is evident, then, that the following diseases are associated with a lack of the lime and phosphorus in the feeding:—Osteo-malacia, rickets (in association with other causes), partial paralysis of pigs (in some cases at least), sterility, premature birth, and abortion (sometimes). It is evident, further, that the deficiency is responsible for a lowering of vitality, and consequently of production. How is this deficiency to be made good? In dealing with osteo-malacia Henry (21) stated:—

"In many places it has been observed that cattle in the early stages of the disease, if moved from the affected country, rapidly recovered; that cows showing symptoms during lactation and pregnancy recovered on being dried off; and that feeding on bran and oil-cake exercised a highly beneficial effect. Such results are readily explained if we consider the cause as being essentially one of soil poverty.

"The following curative measures are suggested:—

"1. In the case of cows hand-fed, the addition of two or three tablespoonfuls of sterilised bone-meal to the feed daily will be found highly beneficial.

"2. Cows and other cattle not hand-fed should be provided with a lick composed of salt, 40 parts; sulphate of iron, 1 part; and bone-meal, 10 to 20 parts. The bone-meal should be first mixed in a small proportion, as the cattle may not at once take to it, although, if they are noted bone-chewers, there will be little difficulty. It may be later increased to equal parts or more with the salt. If desired, and the cattle will take it, the bone-meal may be given alone, as it is, of course, the essential part of the lick. The addition of a little molassses will add to the palatability of the mixture, and increase its nutritive properties.

"3. The addition of bran or oil-cake ration to the feed of hand-fed cattle will be found useful.

"4. Manuring and improving of pastures must, of course, lead to enrichment both of soil and herbage, and so check the ravages of the disease; and the use of superphosphate and bonedust, and the liming of pastures would all be found helpful, especially on small holdings of fairly good country. With the large grazing areas of poor country it is, of course, impracticable."

That advice holds good to-day, and for all the other conditions referred to as well as to osteo-malacia.

The feeding of bone-meal licks has become widespread, but there are still many farmers who do not realise the benefits which may be derived from them. Not only are the cattle protected and their productive capacity increased, but the succeeding generations will benefit. Hart and his co-workers pointed this out([22]), stating that Hess and Schaffer reported that when 50 grams of calcium phosphate were added to the daily food of four cows, the milk contained an increased proportion of that compound, and these experiments are supported by Passon, who emphasises this as of importance in enriching the mother's milk in calcium phosphate. If pregnant and suckling mothers are not supplied with calcium phosphate they must draw on their own body supplies for the fœtus and the young animal, and sooner or later must break down under the strain. Bone-meal is the most economical and most easily handled material available for supplying their needs. It must be remembered, also, that any which is not utilised by the animal is passed out in the dung, and assists to enrich the soil.

The feeding of bran and lucerne together will supply all that is required in the way of mineral matters. The two together form an excellent diet, as one supplies what the other lacks. What amount would be required to maintain health would depend entirely on the quality of the pastures.

The remaining method mentioned—that of fertilising the pastures and so reaching the animal indirectly—is only just obtaining recognition in this country. It is a method of preventing disease to which too little attention has been paid, but as the country is more fully utilised it will be found absolutely essential to sound stock-raising in many parts. It has the great advantage that by producing good pastures it not only provides the animal with mineral, but also leads to the production of an ample supply of vitamines, those somewhat mysterious bodies which apparently exercise so important an influence on growth and reproduction. Whether this manuring or fertilising is best carried out by animal manure, superphosphate, or bonedust will depend on circumstances. The Agrostologist and the Agricultural Instructors stationed in different parts of the State should be consulted on such points, and also as to the best types of grasses to be grown under varying conditions.

It is desired here merely to emphasise that calcium and phosphorus can be supplied to stock quite easily, and that in large areas of the State they should be supplied if successful stock raising is sought.

One word of warning it is desired to utter: although at times sterility, abortion, and premature birth may be associated with calcium deficiency, and though the farmer might be well advised to try the effect of supplying these materials if his cattle are so affected, it must not be forgotten that there is a very serious disease, known as contagious abortion, which occurs among the very best fed cattle, as well as among those not well fed. It is necessary to convey such a warning, because there is always a tendency

to spoil the legitimate claims of any method of preventing or curing disease by making extravagant statements concerning it. Of the necessity of supplying calcium and phosphorus in sufficient quantities to much of our live stock there can be no doubt.

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INFECTIOUS DISEASES REPORTED IN OCTOBER.

THE following outbreaks of the more important infectious diseases were reported during the month of October, 1925.

Anthrax	1
Pleuro-pneumonia contagiosa	8
Piroplasmosis (tick fever)	Nil.
Swine Fever	Nil.
Blackleg	Nil.

—MAX HENRY, Chief Veterinary Surgeon.

CALICO FOR FUMIGATION SHEETS.

THE material from which the tents or sheets used in the fumigation of citrus trees are made should be a closely-woven strong calico, one which will not show open patches when held to the light. A pocket lens is useful for examining a calico, which should show a uniform weave when inspected through the glass. The material may also be tested by holding it over one's mouth and trying to blow through it. Care should be taken to see that the calico does not only appear to be closely woven through carrying some dressing.—W. LE GAY BRERETON, Assistant Fruit Expert.

The Progress of Tick Control on the North Coast.

C. J. SANDERSON, Chairman, Board of Tick Control.*

A CONSIDERATION of operations in the area quarantined for cattle tick during the period 1st July, 1924, to 30th June, 1925, reveals that a greatly increased amount of work has been carried out by the staff, and also that a further advance has been made towards the goal of complete eradication of the tick. The following table compares the work carried out in the years 1923-24 and 1923-25:—

	1923-24	1924-25.
Cattle examined..	3,032,209	3,425,722
Working bullocks examined	98,931	132,957
Horses examined	44,895	89,998
Cattle dipped	599,593	1,003,621
Cattle sprayed	251,931	318,714
Working bullocks dipped	10,426	45,080
Working bullocks sprayed	48,840	49,874

For the first time in the history of tick eradication in New South Wales the number of cattle dipped for the year was more than a million head, exceeding the previous year's total by no less than 438,682. It is satisfactory to report that this vast amount of dipping was carried out without friction, with a minimum of inconvenience to the stockowners, and with little or no detriment to the cattle.

The Attitude of Farmers.

Perhaps the most encouraging feature of the year's work was the attitude of the farmer towards dipping. A large amount of voluntary dipping took place. Mr. Inspector Glennie, in charge of The Tweed quarantine, northern section, in his annual report stated:—"The farmers, after the experience when the area was abandoned, have continued to dip most regularly, and it was very noticeable the number of milking cows which regularly went through the dips; event tenant and share farmers showed no objection to regular and continuous dipping."

Mr. Inspector Chatham, in charge of The Tweed quarantine, southern section, reported as follows:—"Quite a number of stockowners have formed themselves into groups and have expressed their willingness to lease the land, supply timber, erect yards, crushes, &c., provided the Department will construct the dip, draining pens, &c. This goes to prove that they have the work of eradication at heart, and I would strongly recommend that their wishes be acceded to, as the more dips we have the more expeditiously and effectively is the work of eradication carried out."

* Extracted from the annual report of the Board of Tick Control for the year ended 30th June, 1925.

In other areas many farmers now prefer to dip their cattle rather than have them examined for ticks. In fact, a spirit of true co-operation in the work is slowly developing and replacing the attitude of suspicion and opposition which formerly existed.

The Present Infestation.

The meterological conditions during the period covered by this report were ideal for development of tick-life, and yet, in spite of this fact, the examination of cattle in all quarantines outside the Tweed showed a 66 per cent. decrease of infestation as compared with the previous year.

The decrease of infestation in the Bonalbo and Woodenbong areas last year was so marked as to encourage the hope that this year's work would entirely eradicate the pest; unfortunately, ticks still remain in these areas, though an inspection of 322,482 cattle only revealed twenty-four infested animals. At the end of June, 1925, it was found possible to release the Tabulam quarantine and to make the southern portions of both the Casino and Bonalbo areas into buffer areas. The present position is that the Tweed southern section and the Kyogle quarantines are heavily infested, while the remainder of the quarantined area is very lightly infested indeed. With any other pest but the tick it would be possible to modify greatly the quarantine conditions in such lightly-infested country, but, owing to the alarming rate at which ticks propagate (one female tick can have seven billion descendants in seven months) it is necessary to destroy the last tick in any area before it is safe to release it from quarantine.

Success on The Tweed.

The American system of tick eradication, which has produced excellent results, is to take an area of country (usually a county is selected as the unit) and dip every head of stock in that area for a period of six to eight months. The Americans realise that by so doing they may treat many clean herds, but they also argue that by dipping every head the clean herds are protected from infestation while the infested herds are in process of being cleaned. With the system which has been in operation so long in New South Wales, of only dipping herds known to be infested, it not infrequently happened that an infested farm (A), while being treated, would infest its neighbour (B), and frequently (B) would return the compliment the following season.

In the Tweed area the American system has been adopted, and in the northern section, for a whole year, the treatment has been regular and continuous, all stock being dipped every twenty-one days, except during the winter months. This system has practically eliminated the tick from an area in which at least 95 per cent. of the farms were very heavily infested indeed. Another season of such treatment will certainly get rid of the last tick, and prove an object lesson of the effects of systematic dipping applied over a large area.

In the Tweed southern section, the Board of Tick Control only resumed active control in January, 1925. The treatment adopted was the same as in the northern Tweed, and, although only five months' dipping took place,

the results were so satisfactory that the inspector in charge is of opinion that whereas 98 per cent. of the farms were heavily infested in January, less than 20 per cent. were infested in June. So much for compulsory treatment as opposed to inspection and treatment of only those herds found tick-infested.

In New South Wales far too much reliance has been placed in the past on inspection as a means of dealing with the tick. It cannot be too well understood that a beast may have thousands of seed ticks on it without the inspector—even as the result of a diligent search—being able to discover a single tick. In heavily-infested country, when cattle are exposed to infection daily, ticks past the second moult would practically always be in evidence and capable of being discovered, but in lightly-infested country, with monthly inspections, it is quite easy to miss the discovery of ticks for months. Should such cattle be moved on inspection without treatment they would certainly infest fresh country. There can be little doubt that this happened on many occasions. The present Board of Tick Control has recognised the necessity of treating all cattle moving in the quarantines, and much of the decrease of infestations I attribute to this.

Another reason for the decrease is the increased attention paid to working bullocks, and also the fact that teams working on the roads must be treated. The former system of only treating teams if found infested was futile to a degree. The drivers of bullock-teams were, in many cases, quite as expert in discovering ticks as the board's inspectors, and took good care that the inspectors did not discover ticks. As a consequence, roads used by teams were always tick-infested.

Fences and Dips.

Great attention has been paid during the past year to the boundaries of quarantine areas. Many miles of fences have been erected between the various quarantines, in addition to taking every advantage of the fences of the settlers. The objects of having secure boundaries are many. Such fences, adequately patrolled, prevent unauthorised stock movements, form lines to work up to, keep areas cleaned from being reinfested by straying stock or stock moving without permits, and cut off heavily-infested areas from those lightly infested.

It is certain that without the very effective boundary fence erected by the Department between the Tweed and Bangalow areas, the heavily-infested Tweed cattle would have been the means of infesting the Bangalow area extensively. As a proof of the effect of this fence, it is pointed out that whereas the southern Tweed was for two years as heavily infested as any area in Queensland, owing to the Government abandoning control of the area, the Bangalow quarantine, lying immediately to the south of it, was enabled practically to eradicate ticks during the same period.

The Queensland border fence, which was in a deplorable state, has been completely put in order, including over 8 miles of new fencing, and during the year twenty-five dips were constructed.

The Stock Diseases Act, 1923, invests the Board of Tick Control with the power effectively to carry out the work of eradication, and the staff is now adequate in numbers, properly organised, well supervised, and so distributed that the men are not only close to their work, but are so placed that they can watch and control all movements.

The Board of Tick Control, composed entirely of stockowners, has shown an earnest desire to grapple with a problem which is admittedly a most difficult one. While enforcing all necessary measures for the eradication of the pest, it has endeavoured to do so with a minimum of inconvenience to the stock-owning public. The period under review has shown a great advance in the work, and there appears every prospect of an early and successful conclusion to it.

Export of Tomatoes to Java.

Although considerable quantities of tomatoes are grown in Java, there is a shortage of the locally-grown product during the months extending from September to April, and from October to March tomatoes are stated to be almost unobtainable. "It would thus appear," states H.B.M., Commercial Agent for the Netherlands East Indies, Batavia, "that there should be a fair market in the Netherlands East Indies for Australian-grown tomatoes during at least six months of the year."

The names of two firms with whom interested persons might communicate are obtainable on application to the Department of Markets and Migration, Melbourne.

California Citrus Growers' Organisation.

According to a report presented to the British Ministry of Agriculture by R. B. Forrester, M.A. (Cassel Lecturer in Commerce, London University), on large-scale co-operative marketing in the United States, the following are the economic services rendered to its members by the California Fruit Growers' Exchange:—

1. The Exchange markets 70 per cent. of the citrus fruit of California.
2. It has standardised production by unifying grade standards for oranges and lemons; it has improved handling practices.
3. It has created a comprehensive system of salaried agencies, which is an innovation in the marketing of perishable products, and has attempted to reduce hazard to a minimum in distribution.
4. Stimulation of the demand of consumers has been attained by advertisement, a study of retailers' requirements, and the introduction of juice extractors. Further, the marketing season for oranges has been expanded by planting the Valencia orange.
5. The association has been active in procuring favourable freight rates, refrigerator service, and in dealing with questions of damage in transit.
6. The use of by-products reducing waste is a notable achievement, although such enterprises operate under the handicap of a fluctuating supply

Renovating and Re-working Orange Trees.

R. J. BENTON, Fruit Instructor.

In another article in this issue the orange-growing industry is reviewed, and a strong recommendation is made to all growers concerned to go carefully through their orchards, and (1) to maintain suitable trees in good heart by pruning (when necessary), judicious feeding, and eradicating any pests or diseases; (2) to re-work inferior varieties and unsuitable types of oranges, if such trees are not too old or too weak; or (3) to dig out all non-payable trees.

In connection with the latter class, there is no need for further remark beyond urging prompt burning as soon as they are removed.

Regarding the re-working of inferior varieties, there are two methods of accomplishing this object, viz., by budding or grafting. Usually the insertion of buds obtained from selected trees into vigorous young shoots forced out after dehorning, or after a severe cutting back of the main limbs or trunk, is the most satisfactory method, but grafting is also frequently done. Moreover, a combination of the two methods may be employed.

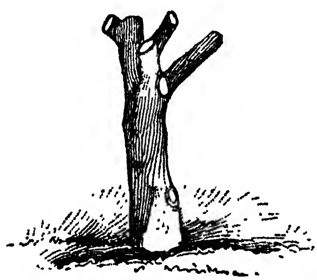
The requirements and conditions necessary for the success of either operation are:—

1. That the movement of the sap must be free, which ensures the bark being in good condition for lifting, and for assisting in the graft or bud forming a good union.
2. The weather should be fine; rainy or very windy weather is to be avoided while the work is actually being done.
3. Knives used must be keen.
4. The operation of budding or inserting grafts must be carefully and fairly quickly done.
5. Buds or grafts must be firmly and securely tied to ensure that a good union is effected.

As a rule it will be found advantageous to graft unsuitable trees. This is commenced by sawing off the limbs or trunk at about 24 inches from the ground, and inserting several scions according to the size of the wound. Should these scions not "take" it will be found that a great number of shoots are forced out, which, if thinned only to number six to nine, may be budded in December or autumn. Thus the opportunity of success is a double-barrelled one, which should ensure that the trees operated on will be again in bearing in three years' time.

Remembering that the leaves are the lungs of the tree, best and quickest results will be achieved by leaving one or two limbs of the tree uncut for a season or two, and removing them after the re-worked limbs have made a new "head." The operations in detail may be stated as follows:—

About the time of bud-bursting in spring, the limbs should be cut off squarely at the desired height with a small tooth saw—leaving one or two limbs in the centre if possible. Many trees, however, may have to be cut square across the trunk. Either cleft-grafting (splitting the stock and inserting the wedge-shaped scion in the cleft or split) or making a slit in the bark to enable a sloping cut scion to be inserted and pushed in, may be employed. Tying of scions must be then securely done, and air excluded from the wound by covering with grafting wax. A little wax applied to the end of the cut scion is also necessary. A scion with only three or four buds showing is ample. Insert more than sufficient scions, as even if all take those not required will be helpful in healing the wound quickly. If



Orange Tree cut back for Grafting or to force out New Shoots preparatory to Budding.
It is advisable to leave one or two limbs uncut in the centre of the tree if possible.

Showing Growth of Shoots in the base of which Buds are Inserted.

the tree stem is exposed, it should be covered with a thin whitewash or otherwise protected to prevent the bark becoming sunburnt. Nothing further is done until growth commences, when if the scions have taken, any other shoots should be kept rubbed off the stock. As the shoots from the scion grow they should be tied up to prevent them from being blown or knocked off.

If trees have not been cut down and grafted in the springtime, they may be cut off and grafted up to Christmas. It is not advisable to cut later, as the growth arising from the stock or scion would probably be severely injured by frosts in the following winter.

If the grafts have not taken, many young shoots will be forced out on the stock. On becoming a few inches long these should be thinned out, leaving six or nine well-spaced shoots around the trunk, or two or three

shoots on each limb. The best of these shoots should be protected by tying if necessary to prevent them being broken off, as it is necessary that they grow as well as possible to be budded into during autumn.

One or two buds may be inserted and securely tied into each strong shoot that is well spaced around the limb or trunk of the tree. After an interval of about two weeks, the buds should be inspected, and if plump and green it can be concluded that they have united with the stock. The strings should then be cut and the stocks left until next spring, when they will be cut back to within about 5 inches of the bud. Only the bud should be allowed to grow, and as it develops it should be tied to the 5-inch piece or stub left above the bud. This stub is to be removed a few months later, so that the wound where the bud is inserted will heal over nicely. The operation of budding and grafting explained in greater detail will be found in Farmers' Bulletin No. 63, "Orchard Nursery Work," obtainable from the Government Printer, 10d., post free.

A Re-worked Tree showing First Year's New Growth.

Re-working of undesirable varieties of oranges was fully explained and excellently illustrated in the *Agricultural Gazette* of July, 1901, by Mr. W. J. Allen.

The selection of wood for grafting or budding purposes demands the greatest of care. To ensure getting 100 per cent. of trees true to type, it is now definitely established that to obtain wood from a good tree is not sufficient. The only sure way is to obtain the wood or to definitely mark it while the fruit is on the tree. Only wood should be used which can be

obtained for a short distance immediately behind the fruit that is of desirable type. Oranges vary in their qualities even on the same tree, and it is by such careful selection only that the continued propagation of the good qualities can be ensured. These articles have been written in an endeavour to raise the standard of oranges produced in this State, so the vital point of securing the best buds for the work cannot be overlooked.

Renovating Trees.

Most of the trees in this class are probably "run down," and in this exhausted state they are an easy mark for attack by diseases and pests, which quickly cause branches and perhaps limbs to die. Judicious pruning must be given to such trees. All dead wood must be removed by cutting out and perhaps cutting further back into healthy wood. Overcrowded limbs should be thinned out somewhat—not letting too much sunlight in, however. Unless trees are very weak, they should not be pruned too severely, though if a weak tree is worth retaining the formation of a new head may be advisable. This is effected by cutting limbs right back almost to the crown. Protect the stems with whitewash or other suitable shield from sunburning, and when new growth is forced out a few weeks later, thin out such growth to the number of shoots necessary, to form the new head. Should the proportion of trees that require re-working or drastic pruning be large, do them progressively—say half this year and the balance next year.

If scale pests are present the most efficient method of dealing with them is fumigation. Once the tents are procured, the actual cost of chemicals used is little more than the cost of spraying. As at least two sprayings are necessary to give a fair control of scale pests, the cost is greatly in favour of fumigation. When it is remembered how inefficient spraying is, with its attendant risk of serious marking of fruit and at times defoliation of trees, as compared with one fumigation proving quite a complete control of scale, and with a minimum or no damage at all to fruit or foliage, the experienced grower will have no doubt as to which is the best. Every point is in favour of fumigation, especially now that the new calcium cyanide (so convenient to use, and not in the least injurious to tents) is available. If fungoid diseases are present, such as scurf, melanose, black spot, &c., spraying must be done.

Weak trees must be forced into a more vigorous condition by feeding. Undoubtedly, stable manure is the best means of producing this condition, but it is not obtainable in sufficient quantities. Chemical fertilisers alone will not, as a rule, give the best results, though they are very helpful if used in conjunction with organic material Any old litter, such as decaying hay, straw, or bush scrapings will assist in improvement. A dray load per tree of surface soil from unused paddocks is excellent, and if applied about every second or third year should keep the trees in a thriving state. The soil or organic material applied should be supplemented with other fertilisers, such as blood and bone, superphosphate and sulphate of ammonia, and in some cases sulphate of potash will be of benefit.

The soiling or application of litter may be made at all times when convenient to cart, but the more stimulating fertilisers are best applied just before or at the time of commencement of spring and autumn growth. Applications of fertilisers may usually be safely made of 1 lb. for each year of the tree's age; thus, a 12-year-old is likely to require 12 lb. of fertiliser. Every orchard must be dealt with individually on this question, however. Applications of certain amounts or the kind of manure needed cannot be stated definitely, except in a general way. As a rule if trees are lacking vigour and a healthy, dark-green colour, apply nitrogenous manures, such as sulphate of ammonia, dried blood, or nitrate of soda. If the colour of the trees is good and they have sufficient vigour, superphosphate should be applied. If the fruit is inclined to run small, applications of sulphate of potash appear to be the best, using about 1 to 3 lb. per tree.

The slogan for the orange-grower must from now onward be "only the best quality in quantity," and, if this is practised, it is certain much of the dissatisfaction now felt will disappear, owing to the higher standard produced causing a much better demand by the public both locally and abroad.

A Hand-feeding Inquiry.

Owing to the low rainfall, wrote a correspondent in the Narrabri district recently, he had been compelled to hand-feed his flock, comprising 260 ewes (4-tooth to full mouth) and 130 lambs (aged from 1 to 4 months), and had been feeding dry maize at the rate of 4 oz. per ewe, cutting apple and gum saplings to make bulk. The sheep, though looking moderately well, apparently suffered from some gastric trouble, which lying on the soft bank of the river watering the property appeared to relieve. The animals were too weak, however, to extricate themselves from this boggy ground. How should he assist them to get rid of the wind in their stomachs after removing them from the river, and upon what should he feed them during the following few days?

The writer was advised to build up the health of his flock by giving the animals something more satisfactory than scrub as a bulk food, rather than to treat individual sheep medicinally as they became ill. Scrub was of very little use as a food for ewes rearing lambs, and was very liable to cause stomach disorders, such as constipation, &c.

Much more satisfactory results would be obtained if the maize was mixed with, say, 1 lb. per head of lucerne hay, or wheaten or oaten hay or chaff. If the feed was damped with a weak solution of molasses and water the benefit would be even greater. The addition of molasses made the feed more palatable, and helped to regulate the action of the bowels. In the feeding of chaff it would be necessary to use troughs, otherwise a lot of the feed would be wasted. The use of Epsom salts was beneficial when feeding dry foods.

The correspondent was supplied with the departmental pamphlet, "The Feeding of Sheep in Times of Drought," a copy of which is obtainable post free by any farmer.—E. A. Elliott, Sheep and Wool Instructor.

Orchard Notes.

December.

W. J. ALLEN and H. BROADFOOT.

The practice of thinning merits the attention of all growers of pomiferous fruit. There are some commercial varieties which require thinning only under exceptional circumstances, but on the other hand there are others, such as Yates', Rokewood, and others, which bear their fruit in clusters, and which greatly benefit if thinned judiciously.

The thinning should be done after the fruit has set well, and after natural thinning has taken place. When thinning it is important to see that fruit is well spaced, and that the best and biggest fruits are left on the tree. Any fruit showing bad blemishes or malformation should be removed. The principal advantages of thinning are as follows—

(*a*) It lightens the overloaded tree.

(*b*) It gets rid of ill-formed and blemished fruit to the advantage of the better specimens.

(*c*) It assists in securing more regular crops of marketable fruit.

(*d*) It increases the efficiency of spray application, for when fruits are in large clusters it is more difficult to secure effective coatings of fungicides for black spot, or of insecticides, such as arsenate of lead, for codlin moth, over the apple.

It is hardly necessary to say that pears, such as Winter Cole and Beurre de Capiaumont, should be treated similarly to the apples.

It is also beneficial to go over any young trees which have developed limbs too weak to carry a crop and pull off any fruit which such limbs will be unable to carry, and the breaking down of which will destroy the symmetry of the tree.

In many cases young trees, particularly when they have not been headed back hard on the leaders during the winter, carry fruit on the extremities of the limbs, and in such cases (especially when the leaders are weak) a few apples will cause a limb to break or twist or retard the growth of the tree. Thinning obviates this undesirable result.

The value of thinning to the tree in this and in other cases more than off-sets the loss incurred by the operation. Even on trees which have come into bearing, although the lower part of the framework is strong enough to carry a good crop, the tops of the leaders may be weak and a good deal of breaking may take place if the limbs are not relieved of some of the fruit. In this case also thinning justifies itself.

Drying Apricots.

To make a good dried article the fruit should be allowed to remain on the tree until fully ripe, but not over-ripe. The method which is generally adopted here is to pick the fruit carefully into cases when it is fairly soft, as in that condition it makes the best dried article. This will probably necessitate going over the trees several times, as the fruit does not all ripen at the one time. As soon as possible, cart the cases to the cutting shed, where the fruit should be carefully and evenly cut in halves (not pulled apart) and the pits removed.

The fruit is placed on trays with the cup side up, and as soon as possible each tray is removed to the fumigator, where it can remain with the door closed until the fumigator is sufficiently full to start the sulphur burning. This is of great importance, as once the fruit has been cut it must not be exposed to sun or wind, or its appearance will suffer. When everything is ready, sulphur should be placed in the burner at the rate of approximately 1 lb. to every 200 cubic feet of room space. If possible, allow the fruit to remain in the sulphur room from eight to ten or twelve hours, or until the cup is full of juice. It can then be taken from the fumigator on the trays and placed on the drying ground. When the sun is the sole or main drying agent a drying ground must be provided, and to facilitate and provide for economic working the ground must be laid out in such a way that the fruit can be carried on trucks to any part of the ground. It is one of the essentials of the drying ground that it should be as free from dust as possible. When stone fruit is being dried it is better not to leave tracks or paths between the trays, but to cover the whole of the ground, so that there are only the outside trays to watch. The borders and any paths that are left should be kept well sprinkled with water.

Growers are advised to get the bulletin on "Fruit Drying," issued by this Department. The price is 10d., post free.

Marketing.

Large consignments of stone fruit will soon be coming forward. To secure a good demand every attention should be paid to sizing, grading, and packing. The fruit should be picked when firm, but properly matured. Growers would do well to keep in mind the fact that some time elapses between the time the fruit leaves the orchard and the time it reaches the consumer, and if it is over-mature when it sets out it has little chance of reaching the market in anything like good condition. Stone fruits which are over-ripe or bruised cannot be sold at prices satisfactory to the grower. It is important to ensure, when packing for market, that cases are not packed too high or the fruit forcibly squeezed into its place. Care in handling is of paramount importance, as in order to keep the fruit in excellent condition it is absolutely necessary to see that its skin is kept intact.

Pests.

The second cover spray for codlin moth will be applied towards the end of this month. Including the calyx spray, this will be the third application. Keep a stringent watch for all possible sources of infestation and infection,

such as returned cases. Such cases should be immersed in boiling water for not less than three minutes. This will effectively kill any grubs which may be sheltering between the joints.

Amongst the many pests which should engage the vigilance of the fruit-grower is the fruit fly. Growers in those districts which are free from this pest should do all that is possible to keep them free, while in infested districts every endeavour should be made to keep the pest in check, and any fruit found to be infested should be promptly burnt. It is necessary, in order to secure satisfactory results, that all growers should recognise their responsibilities, and by common effort—sustained, systematic, prompt, and thorough—whatever action science, experience, and the necessities of the position require, should be taken. Only in this way can satisfactory results be achieved.

Fallen and infested fruit should be regularly picked up and burnt. It is disastrous to wait until the maggot has left the fruit. Let the maggot be destroyed in its most vulnerable stage—that is, when it is still in the fruit.

A strict watch should be kept for slugs; they are quite easy to control, but if not effectively attacked may do a considerable amount of damage. They may be observed on cherry and on pear trees, upon which they so destroy the leaves and so damage them as to interfere seriously with their functioning. Spraying with lead arsenate will prove effective.

Cultivation.

This is one of the essentials of good and profitable fruit production, but how frequently is it neglected or performed perfunctorily, or too late! Conservation of soil moisture, by destroying weeds and by forming a good surface mulch, is one of the marks, when well performed, of good tilth. Tilth is the sheet anchor of successful farming, and the chief protection against dry spells and devastating drought.

Irrigation.

When irrigation is practised care should be taken thoroughly to soak the subsoil, and to confine the water to furrows. So soon as the surface is dry enough, the cultivator should be kept going to form a good surface mulch. The ideals are—a minimum of water; a maximum of cultivation.

Drains.

Surface drains must be kept clear, as heavy storms frequently occur during summer months; and if adequate provision is not made for carrying off storm water much soil may be washed away, and the grower will be put to much labour and expense in replacing it.

THE milk of cows kept in open pasture has a marked and high antirachitic value, while if the animal is kept in a dark cowshed it yields a milk much inferior from the point of view of its effect on rachitic conditions.—E. M. LUCE, in the *Biochemical Journal.*

Poultry Notes.

December, 1925.

JAMES HADLINGTON, Poultry Expert.

No hatching season of recent times opened with greater promise than that of this year, but it is safe to say very few have closed with less promise as far as the outlook for the industry is concerned. The change has been brought about by a combination of circumstances.

In the early months of the year the prices of poultry foodstuffs, while still high, were not on the average very materially higher than for the same period of the previous year, and the prices being received for eggs were but a shade lower. Therefore, the promise during the early months pointed to a similar return over cost of feeding to that obtained last year. From the month of May onward, however, a change came over the position both in respect of eggs and poultry foods. Pollard and bran, which form about 50 per cent. of the entire food fed to poultry, took an upward tendency, while the price of eggs fell somewhat. This position became accentuated with the advancing months, and the period over which chickens were reared has shown a still greater disparity between the cost of feeding and the price received for eggs. At the present time poultry-farmers are much perturbed at the outlook, and are seeking some solution of their troubles.

What transpired at the conference held on 7th and 8th October and the course of events since has shown that a state of flux exists, and there is a disposition to plunge into any action which seems to promise relief from the troubles. If, however, there was ever a time when it was essential that poultry-farmers should keep cool it is now. A false move may result in the last state being worse than the first.

The action now taken to form a strong association is the right one, but it should be recognised that the re-organisation of the marketing of poultry products will take time to bring about. What has got to be avoided is precipitate action which might cause many farmers to be ruined before reform is effected. In the meantime the farmer will do well to keep himself informed of the facts in connection with the economic position of his industry. Perhaps the review of prices on the next page, &c., will assist in that direction.

These tables show that the returns have not kept pace with the cost of production over the period covered by the figures.

With regard to the rise in prices of foodstuffs, drought in the coastal areas is largely responsible. The enormous demand for pollard and bran has enabled millers to get their own price. In these periods of drought the same conditions always have been and always will be the same in respect of demand for the foodstuffs ordinarily fed to poultry.

Wholesale Prices of Foodstuffs.

Month.	1924. Wheat per bus.	1924. Maize per bus.	1924. Pollard per ton.	1924. Bran per ton.	1925. Wheat per bus.	1925. Maize per bus.	1925. Pollard per ton.	1925. Bran per ton.
			£ s. d.	£ s. d.			£ s. d.	£ s. d.
Jan. ...	5/-	6/3	6 10 0	5 15 0	6/- to 6/6	4/-	7 0 0	5 10 0
Feb. ...	5/-	5/2	6 10 0	5 15 0	6/9	4/-	7 0 0	6 0 0
Mar. ...	4/11	5/2	6 0 0	5 10 0	6/9	3/9	6 0 0	5 0 0
April ...	5/-	5/1	6 0 0	5 10 0	6/9	3/10	6 0 0	5 0 0
May ...	5/-	5/1	6 10 0	6 0 0	5/9	4/10	7 10 0	7 5 0
June ...	5/3	4/6	6 10 0	6 0 0	5/9	4/3 to 4/6	8 0 0	7 0 0
July ...	5/6	4/3	5 10 0	5 0 0	5/9	4/3	7 10 0	6 15 0
Aug. ...	5/6 to 6/6	4/3 to 4/6	6 10 0	6 0 0	5/9	5/-	7 10 0	6 15 0
Sept. ...	6/1½	4/3	6 10 0	5 10 0	6/4	5/2	8 0 0	7 10 0
Oct. ...	6/3	4/1	7 0 0	6 0 0	6/4	5/3 to 6/-	8 10 0	8 10 0
Nov. ...	5/1½	6/-	7 10 0	7 2 6	6/4	6/- to 6/3	8 10 0 to 9 10 0	8 10 0

Wholesale Prices of New Laid Eggs.

1924.		per doz. s. d.
Jan.	1st to 30th	1 6
	31st	1 9
Feb.	1st to 7th	1 7
	8th to 12th	1 10
	13th to 28th	2 0
Mar.	1st to 11th	2 0
	12th to 25th	2 3
	26th to 31st	2 6
April	1st to 7th	2 6
	8th to 30th	2 9
May	1st to 31st	3 0
June	1st to 18th	2 9
	19th to 25th	2 6
	26th to 30th	2 3
July	1st to 7th	2 3
	8th to 20th	2 6
	22nd to 28th	1 10
	29th to 31st	1 6
Aug.	1st to 23rd	1 6
	24th to 31st	1 4
Sept.	1st to 30th	1 4
Oct.	1st to 31st	1 4
Nov.	1st to 12th	1 4
	13th to 30th	1 6

1925.		per doz. s. d.
Jan.	1st to 15th	1 6
	16th to 31st	1 8
Feb.	1st to 3rd	1 8
	4th to 28th	1 10
Mar.	1st to 8th	1 10
	9th to 15th	2 0
	16th to 22nd	2 3
	23rd to 31st	2 6
April	1st to 27th	2 6
	28th to 30th	2 9
May	1st to 31st	2 9
June	1st to 28th	2 9
	29th to 30th	2 3
July	1st to 5th	2 3
	6th to 17th	2 0
	18th to 31st	1 9
Aug.	1st to 11th	1 6
	12th to 31st	1 4
Sept.	1st to 30th	1 4
Oct.	1st to 8th	1 4
	9th to 15th	1 1
	16th to 21st	1 2
	22nd to 31st	1 4
Nov.	1st to 18th	1 4
	19th	1 6

From time to time the question of finding substitutes has occupied the attention of the Department and all who have the poultry interest at heart. But it is questionable if there are at present, or are likely to be, substitute foods anywhere in sufficient volume to relieve the position very materially. This is owing to the fact that dairymen appear to be able to compete in the matter of price with poultrymen for the same class of foods.

Poultry-farmers are endeavouring to find some scheme whereby the cost of production is made the controlling factor in the price of eggs and poultry. This, it will be remembered, was the subject of one of the principal motions carried at the Conference of Poultry-farmers on the 7th and 8th October. Unfortunately, it is much easier to carry motions than to put them into effect, but if the poultry industry is to be maintained and to expand, some action is necessary to bring the selling price more in conformity with the cost of production. A difficulty, however, presents itself when one endeavours to arrive at cost of production.

It is safe to say that any half-dozen poultry-farmers would give as many different versions as to the cost of production. It is equally safe to say that some of them would be very wide of the mark, because they would be based either on wrong premises or on their individual returns.

In order to touch this subject ever so lightly and to counteract some of the extravagant statements now current predicting the collapse of the poultry industry, etc., a few figures are submitted showing the extra cost of production as far as eggs are concerned in relation to the recent rise of £3 per ton in the price of pollard and bran.

Taking as a basis a "12-dozen hen," and as the period—the last two months of production (October and November), it works out that every £1 per ton rise in the price of pollard and bran adds one farthing to the cost of producing a dozen eggs in actual feeding of the hens that lay them, but owing to the fact that young stock has also to be raised at this time the actual increase is at least double, which, of course, means one-halfpenny per dozen for the two months mentioned, and more during the months of low production.

Three halfpence per dozen on, say, November's quota on a 12-dozen basis (seventeen eggs per hen) would mean £7 1s. 7d. Boiled down, this rise of £3 per ton in the price of pollard and bran, while eggs remained at 1s. 4d. per dozen, meant a loss of 35s. per week on a farm carrying 800 layers. There are, of course, those who will imagine that the loss is much in excess of this figure, but it must be remembered that this calculation only refers to one feed per day, or its equivalent in dry mash, the other feed being assumed to be grain. The loss will, of course, be greater where a higher price is being paid for grain.

Cost of Production.

"Keep down the cost of feeding," should be the slogan on every farm, but it is to be feared that there are many farmers who feed all sorts of expensive foods, and act in this regard as if the more costly their menu the

higher their production. This is not necessarily so, and where the simple ration is being departed from, the production should be very closely checked from time to time, or there may be great loss due to feeding expensive foods.

The same thing applies to rearing chickens. At the present time many inducements are held out to farmers to feed all sorts of expensive foods, which they are assured will give better development, but in many cases the net result is that it costs double what it should do to rear chickens.

It has been stated that it will cost much more than £12 10s. per hundred—the amount mentioned in "Poultry Farming in New South Wales" (fifth edition)—to feed chickens. The answer will be of general interest. It is, in effect, that the price of pollard and bran (the principal food for chickens) is at present abnormal. It is not possible to calculate cost of feeding by taking the price and quantity of feed at any one time. To ascertain cost of feeding chickens to a given age one must commence with the first feed, and debit all food given to them throughout the whole period under check. The many difficulties in the way of doing this on the average farm, where different ages are being reared at the same time, makes it almost impossible to arrive at cost of production under such conditions. Then again, the cost of rearing as between early and late chickens might differ very materially.

In connection with costs it should be borne in mind that no foods will make up for neglect or inefficiency in rearing, and that it takes good management to secure the best development from the food, no matter of what class. As an illustration of this fact, it is worthy of mention that while the early chickens this season have for the most part come on well, there are now to be seen many thousands of the later hatched ones which are much below par in development. The main cause has been bad management during the many cold changes in the weather for which this spring has been notable. The trouble in nearly every case has been the withdrawal of warmth too early, and when a cold snap has eventuated the chickens have packed and chills have been the result.

It is a mistake to withdraw the brooding warmth under six weeks old, and those who have done this during the present season will have paid dearly for the small amount of labour or fuel that has been saved in withdrawing the warmth too soon. It applies no less to fireless brooding than to heated brooders.

A FARMER is not safe in figuring his profits over less than a five-year period; and instantly to put the profits of a big year into more land means that in an off-year the mortgage interest is going to swallow him. . . . A farmer is never in a safe position until he has in negotiable securities a sum sufficient to carry him through two bad crop years. This is elemental farm finance and it is elemental business finance. It is insuring the capital invested.—SAMUEL CROWTHER, in the *Country Gentleman*.

AGRICULTURAL SOCIETIES' SHOWS.

Secretaries are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 18th of the month previous to issue. Alterations of dates should be notified at once.

1926.

Society.	Secretary.	Date.
Albion Park A. and H. Association	H. R. Hobart	Jan. 1, 2
Dapto A. and H. Society	E. G. Coghlan	„ 15, 16
Northern Suburbs A. & H. Association (St. Ives)	T. Conway	„ 15, 16
Gosford A. Association	H. G. Parry	„ 22, 23
Kiama A. Society	G. A. Somerville	„ 26, 27
Wollongong A. H. and I. Association	W. J. Cochrane	„ 28, 29, 30
Yanco Irrigation Area A. Society (Leeton)	W. Roseworn	Feb. 9, 10
Mullumbimby A. Society	A. V. E. Overall	„ 10, 11
Shoalhaven A. and H. Association (Nowra)	H. Ranch	„ 11, 12, 13
Tanmoor and Couridjah A. H. and I. Society	E. S. Key	„ 12, 13
Guyra P. A. and H. Association	A. A. Brown	„ 16, 17
Pambula A. H. and P. Society	L. K. Longhurst	„ 17, 18
Wyong A. Association	L. C. Reeves	„ 19, 20
Central Cumberland A. & H. Association (Castle Hill)	H. A. Best	„ 19, 20
Newcastle A. H. and I. Association	E. J. Dann	„ 23 to 27
Tenterfield P. A. and M. Association	W. O'Shea	„ 23, 24, 25
Alstonville A Society	W. J. Dunnet	„ 24, 25
Gunning P. A. and I. Association	G. E. Ardill	„ 25, 26
Tingha	A. J. Dunshea	„ 26, 27
Blacktown A. Society	J. McMurtrie	„ 26, 27
Robertson A. and H. Society	J. F. Rofe	„ 26, 27
Tumut A. and P. Association	T. E. Wilkinson	Mar. 2, 3
Inverell P. and A. Society	W. Maidens	„ 2, 3, 4
Bangalow A. and H. Association	....	„ 3, 4
Hunter River A. and H. Association (West Maitland)	M. A. Brown	„ 3, 4, 5, 6
Wauchope P. A. and H. Society	T. Suters	„ 4, 5
Oberon A. H. and P. Association	F. H Kelly	„ 4, 5
Berrima A. H. and I. Society (Moss Vale)	W. Holt	„ 4, 5, 6
Nepean A. H. and I. Society (Penrith)	C. H. Fulton	„ 5, 6
Central New England P. and A. Assoc. (Glen Innes)	G. A. Priest	„ 9, 10, 11
Mudgee A. P. H. and I. Association	J. H. Shaw	„ 9, 10, 11
Yass P. and A. Association	E. A. Hickey	„ 10, 11
Ulmarra P. and A. Society	....	„ 10, 11
Cobargo A. P. and H. Society	T. Kennelly	„ 10, 11
Manning River A. and H. Association (Taree)	R. Plummer	„ 10, 11, 12
Cessnock A. Association	Bill Brown	„ 11, 12, 13
Crookwell A. P. and H. Society	P. R. Marks	„ 11, 12, 13
Campbelltown A. Society	W. N. Rudd	„ 12, 13
Taralga A. P. and H. Association	W. Jno. Jeffery	„ 14, 15
Batlow A. Society	C. S. Gregory	„ 16, 17
Cumnock P. A. and H. Association	K. J. Abernethy	„ 17
Gundagai P. and A. Society	M. W. Holman	„ 17, 18
Macleay A. H. and I. Association (Kempsey)	N. W. Cameron	„ 17, 18, 19
Camden A. H. and I. Society	G. O. Sidman	„ 18, 19, 20
Rydal A. H and P. Society	V. Bruce Prior	„ 19, 20
Upper Hunter P. and A. Association (Muswellbrook)	R. C. Sawkins	„ 24, 25, 26
Warringah Shire and Manly A. and H. Society (Brookvale Park).	T. Murray	„ 27
Royal Agricultural Society	G. C. Somerville	„ 29 to Ap. 7
Gloucester A. H. and P. Association	H. Watson	April 14, 15
Orange A. and P. Association	G. L. Williams	„ 20, 21, 22
Upper Manning A. and H. Association (Wingham)	C. Stewart	„ 21, 22

AGRICULTURAL SOCIETIES' SHOWS—*continued.*

Society.	Secretary	Date.
Clarence P. and A. Society (Grafton)	L. C. Lawson	„ 21 to 24
Lower Clarence A. Society (Maclean)	T. B. Notley	„ 28, 29
Dungog A. and H. Association	W. H. Green	„ 28, 29, 30
Richmond River A. H. and P. Society (Casino)	....	May 5, 6, 7
Kyogle P. A. and H. Society	L. Campbell	„ 12, 13
Bonalbo A. and I. Society	W. G. E. Johnston	„ 27, 28
Murrumbidgee P. and A. Association	F. H. Croaker	Aug. 24, 25, 26
Cootamundra P. A. H. and I. Association	W. W. Brunton	„ 31, Sept 1
Grenfell P. A. H. and I. Association	T. Weneham	„ 31, „ 1
Young P. A. H. and I. Association	T. A. Tester	Sept. 7, 8, 9
Lake Cargelligo P. A. H. and I. Association	J Costella	„ 8
Ganmain A. and P. Association	C. C. Henderson	„ 14, 15
West Wyalong P. A. H. and I Association	T. A. Smith	„ 14, 15, 16
Cowra P. A. H. and I. Association	E. Todhunter	„ 14, 15
Murrumburrah P. A H. and I. Association	W. Worner	„ 21, 22
Canowindra P. A. H. and I. Association	J Rhue	„ 21, 22
Temora P. A H. and I. Association	A D. Ness	„ 21, 22, 23
Boorowa P. A. H. and I. Association	W. Thompson	„ 22, 23
Barellan P. A. H. and I. Association	J. Doherty	„ 29
Barmedman P. A, H. and I. Association	W. Pemberthy	„ 29
Hillston P. A. H. and I Association	J. Pevers	Oct. 1
Ardlethan P. A. H. and I. Association	R. L. Neill	„ 6
Narrandera P. and A. Association	W. H. Canton	„ 12, 13
Ariah Park P. A. H. and I. Association	J. McInness	„ 13
Griffith P. A. H. and I. Association	M. E. Sellin	„ 19, 20

Coming Agricultural Bureau Conferences.

During 1926, annual district conferences of the Agricultural Bureau will be held at Dorrigo, Bega, Windsor, Young, Dubbo, Singleton, and West Wyalong, in none of which centres has a bureau conference previously been held.

A cordial invitation is extended to all interested to attend any or all of these conferences, and to speak on any matter which may be introduced by delegates for discussion. It is expected that parties will be made up from all the branches in the respective localities, but in every case farmers generally, irrespective of membership of the bureau, will be welcomed. It is hoped, too, that it will be possible for many to attend also conferences other than their own, for the opportunity thus presented of seeing different parts of the State economically and of meeting other farmers is obviously well worth while. All present are invited to vote on all general questions, voting being restricted to accredited delegates only on matters affecting domestic policy.

Although details are not yet available, it may be said that the southern and western conferences, to be held at Young and Dubbo respectively, have departed from the general routine of bureau conferences by focussing the attention of delegates, through the various papers and addresses, on to a special topic.

The conference at Dorrigo will take place on 19th January, while the Bega conference will commence on 3rd February.

Particulars of the other conferences will be published as they become available.—C. C. Crane, B.A., Bureau Organiser.

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